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PEDIGREE LIVE-STOCK.

DEVELOPMENT OF BREEDING IN NEW ZEALAND.

By J. L. BRUCE, Assistant Director of the Live-stock Division.

THE statement that greatly increased production will be essential to meet the country's war liabilities has now become a commonplace, and the question resolves itself into the development of those lines of production most soundly based on our great national assets of climate and soil, as also geographical position. Among various sources of agricultural wealth awaiting further development perhaps none is of more importance and greater potentiality than the breeding of pedigree live-stock. The economic incidence of pedigree-stock-breeding falls under two main headings—domestic and export. The domestic side is naturally the most important, concerning as it does the enormous material benefit to be derived from a general uplifting of the standard and value of commercial animals within the Dominion. On the other hand, the more definite proposition of the export trade is of great value, not only in connection with its cash returns but owing to its stimulating influence on high standards of breed-type. That there

will be a world-wide demand for pedigree stock almost immediately transport is available after the war cannot but be recognized by those who have given the matter any consideration. The sooner, therefore, we take action regarding prospective markets, and increase our ability to meet requirements, the more fully will we participate in a profitable business. This business we are pre-eminently suited to meet, and the following grounds may be cited in support of the assertion:—

(1.) The geographical position of New Zealand and its comparative proximity to prospective purchasing countries—namely, Canada, the United States of America, South America, the Commonwealth of Australia, South Africa, and the Pacific islands.

(2.) The variety of our climate, suited for raising all classes of stock—from the dainty Channel Island cattle to the hardy Aberdeen-Angus or the rugged Scottish Highland breeds; from the fine-combing Merino to the strong-woolled Lincoln; and from the thoroughbred to the Clydesdale.

(3.) The entire freedom from disease in New Zealand export pedigree stock, a clean bill of health accompanying every animal shipped from the Dominion—by no means the least important factor.

(4.) The continuous importation, ever since the foundation of the country, of high-class pedigree stock from Britain by breeders here who thoroughly know their business and how to perpetuate the respective breeds.

If the foregoing statement of our position and claim to rank in the forefront as a pedigree-stock-raising country is not too optimistic we stand well to become the nursery and distributing centre for pedigree stock in the Pacific, as Britain has been and still is for the world. Few have had a better opportunity of knowing this country and its capabilities for stock-raising than the writer, and it is his belief that any claims here set out are well supported by facts. Let the doubter attend, say, a dozen of our agricultural and pastoral shows in the several centres and watch particularly the parades of prizetakers, when all sections are represented, and he can hardly fail to arrive at similar conclusions. Such a verdict has often been heard from capable judges from various parts of the world. Even as far back as the year 1882 the Clydesdale horses and Ayrshire cattle shown at Oamaru were in some respects equal to those at the Highland Society's Show in Scotland the previous year. The Clydesdale mares and young animals shown at Oamaru so impressed the writer on his arrival in this country that the impression then formed and still remaining is that there must be, and undoubtedly are, peculiar conditions existing in New Zealand favourable to the raising of stock. It may therefore be accepted that we not only have the right classes of pedigree stock, but that we have had them for a very long time, and ought to be well abreast of requirements when the clouds of war roll away.

The following will go to show the value of the pedigree-stock business to Britain. In the *Live-stock Journal Almanac* of this year the value of pedigree stock exported from Great Britain in 1916 is given as—cattle, £275,020; sheep, £71,582; pigs, £3,367; and horses, £437,099. As an indication of the extent to which pedigree Shorthorns are bred

in the north of Scotland, the firm of Macdonald, Fraser, and Co. (Limited), of Perth and Aberdeen, report having, in 1917, sold 1,463 head at an average of £111 14s., totalling £163,422 8s. For Mr. William Duthie, of Collynie, in October last they sold twenty-four bull calves averaging £655 16s. 3d. per head, one animal (a March calf) bringing the then record price of £2,835. On the same day, on the neighbouring farm of Uppermill, they sold for Mr. James Durno seven heifers at an average of £333 per head, one heifer bringing £840. Within the same area pedigree Aberdeen-Angus cattle and Clydesdale horses are largely bred, and are a source of steady income to a large number of farmers. Although this is an instance of what is being done in a comparatively small area of Britain, it must not be supposed that pedigree-stock-breeding is confined to a few districts in either England or Scotland. It is practically general throughout the country, each district specializing in the class of either cattle, horses, or sheep for which it is best adapted.

From these figures it will be seen that the return to Britain from the export of pedigree stock is considerable. But however important such a trade may be to the nation it is, as already indicated, relatively of inconsiderable importance compared to the wealth derived from the continuous use of good pedigree sires in the domestic uplifting of the standard and value of commercial animals. One may note, for example, what Argentina and the neighbouring South American States have done in a comparatively short time. No doubt, as purchasers of purebred stock, the pastoralists there have been, and still are, valued customers to the British breeders; but it must not be supposed that this has been merely a passing hobby for having nice-looking animals—by those who could afford it. It was a well-considered and sound business undertaking to increase the wealth of those countries by improving their breeds of cattle and sheep, so as to enable them to profitably contribute to the world's meat-markets. One result is that about 75 per cent. of the beef imported into Britain is now supplied by South America. The quantity in 1916 was about 4,250,000 cwt., valued at nearly ten millions sterling, to which may be added another two or three millions for hides and by-products from these carcases. Had the South American pastoralists been content to continue with their native stock they would probably have had little or nothing to export to-day. This is an excellent demonstration of what it is the object of this article to emphasize—namely, the value of pedigree stock and the consistent use of high-class pedigree sires.*

As showing the importance attached to pedigree by South American buyers and breeders, it is authoritatively stated that no Shorthorn is eligible for the Argentine Herd-book unless the pedigree of both the sire and the dam goes back in unbroken sequence to 1850.

One who has been many years out of direct touch with stock-breeding in the Old Country is apt to form more or less doubtful conclusions as to conditions elsewhere. The writer therefore recently

* The articles entitled "The Bull," "Beef-production," and "The Art of Breeding Live-stock," published in the *Journal* for July, 1913, September, 1915, and December, 1916, respectively, may be referred to in conjunction with the present article.

asked a personal friend, Mr. Alexander Reid, manager and founder of the late Dr. R. McNab's Shorthorn herd and Romney flocks at Knapdale, Southland—who has been in this country only some four years, and who was for many years a leading breeder and feeder in Scotland—for his impression of this country from a pedigree-stock breeder's viewpoint. His reply is interesting, and also well supports the opinions expressed in this article. Mr. Reid says,—

"If it is the climate of Britain that has given her stud flocks and herds the pre-eminent position they hold to-day, then it is possible for New Zealand, and more especially Southland, to do likewise. Breeders in warm climates need to introduce fresh blood from cool climates to reinvigorate the constitution and maintain the quality of their stocks. The first crop of calves in the Knapdale Shorthorn herd has entirely convinced me that we can produce them as well here as at Home. I am also fully persuaded that paddock feeding for breeding-stock is far more suitable than house feeding. In the first place, the stock is far healthier. The cows are less troublesome to get in calf and far less bother in calving. My crop of calves are well grown and in splendid condition. I can now quite well understand the cry for 'hair and still more hair,' made, I think, primarily by the American buyers of Shorthorn cattle many years ago. That cry was answered to the full by the Cruickshank Shorthorn breeders. A thick waving coat of hair is a great boon to outwintering cattle. Paddock-fed cattle may not come to the show-yard in the same finished condition—some practical men say overfed condition—of the cattle with which the show-yards at Home are filled, but they are as well grown and sufficiently developed to show up their good points or where defects lie, and that is all that ought to be asked of breeding-stock. Judges ought to discourage overfeeding of breeding-stock at shows as unpractical and unprofitable. The prospects for stud breeding were never brighter. The demand is world-wide and unlimited. Farmers find that although they succeed in making two blades of grass grow where only one grew before, the improvement is largely nullified unless they at the same time get improved stock to consume the pasture."

It may not be out of place to here briefly examine our position as prospective exporters of pedigree stock. Taking sheep first, the export of stud sheep to South America, the United States of America, Canada, and the Commonwealth of Australia has been going on for a good many years, and will no doubt increase rapidly immediately shipping-space is available. Preparedness to supply these countries and South Africa with exactly what they require in stud sheep, and in sufficient numbers to meet requirements, is a matter which should be kept in sight, for the demand is fairly certain to increase when shipping facilities are available. In the live-stock world our strong feature is undoubtedly sheep.

As regards cattle, it is true we have the right blood in most breeds, but if we are to become an exporting country we have a long way to go before we can attract outside buyers as we have done in sheep. Australia has imported from New Zealand considerable numbers of beef cattle and some dairy cattle, and would take more than we are in a position to supply at present. A glance at the official milk-records of our purebred dairy herds will show that we are offering well in this

direction. With such records, coupled with and supported by long pedigrees, it would be no surprise to hear in the near future of some of these pedigree dairy cattle selling up to four figures.

In horses, as with cattle, we have the right blood, both in heavy and thoroughbred horses, but in these the supply is so far too limited to create a demand or to attract outside buyers to any extent.

While in no way underestimating the value of an export trade in pedigree stock, the way to increased production lies more in what is practically within the reach of every stockowner in the country—namely, to "grade up" and "feed up." Every farmer cannot be expected to be a breeder of high-class pedigree rams, bulls, or stallions. This will always remain in the hands of a comparatively few gifted men. But every farmer can by consistently using long or short pedigree sires so increase his income through the increased value and earlier maturity of his animals that he will not feel too heavily his share in the increased indebtedness of the nation. Crossbreeding in some classes of sheep and certain breeds of beef cattle are no doubt profitable in the hands of men who know how to handle them, but, in the writer's opinion, for all-round purposes and for general benefit of the country there is no sound reason why the ordinary stockowner should not go right after the purebred sires in all classes of stock, and reverse the present order by leaving crossbreeding to the specialist. It is much easier to maintain a purebred herd or flock than a crossbred.

We may imagine New Zealand with practically nothing but purebred and high-grade cattle, sheep, and horses, together with the increased value and annual income from such stock to the credit of the country. As an instance the case may be cited of an owner of a herd of Herefords who sold his calves at ten months old last season for commercial purposes for £9 5s. per head. The value of these animals if well done by will probably be, at two and a half years old, at least £22, as against that of the ordinary "scrub" calf at £3 10s. at the same age (possibly dear at that figure, to say nothing of deaths before winter is over), whose value at three years and a half will be, at the outside, from £16 to £18. Apply this difference in value, in conjunction with earlier maturity (or even half that claimed), to, say, two-thirds of the beef cattle in the Dominion; in the case of dairy cattle an increase of some 50 lb. of butter-fat on 760,000 dairy cows; and an extra pound of wool, earlier maturity, and a heavier carcase in the case of 25,000,000 sheep —when some idea as to the possibilities, on a money basis, of better breeding, feeding, and management can be arrived at.

This does not exhaust our resources: there are at least two other important live-stock industries—pigs and poultry—which might be greatly developed on right lines, but space restrictions will here only allow of attention being drawn to their magnitude in Canada and the United States of America.

Developments in breeding pedigree live-stock such as outlined, in my opinion, might best be entrusted to the able direction of the capable breeders, with which this country is fortunately so well provided, to be applied through the various breed societies and agricultural and pastoral associations. The valuable work which has been done by the various societies and associations, and which is still going on, must be

apparent to every one who takes the slightest interest in the breeding of stock. Extend their powers and functions if need be, but it is to these organizations that we must look if we are to attain the ideal aimed at. The brand of each breed society as to type and pedigree, supported by the Government veterinary certificate of health (and in the case of horses of freedom from hereditary unsoundness), should be the hall-mark upon which purchasers both at Home and abroad can absolutely depend. As an example we have only to look at the British breed societies and pedigrees, the reliability of which has placed the British stock-breeder in the enviable position he occupies to-day in the eyes of the world. Our reputation is in the making, and this the breed societies of New Zealand may well be trusted to faithfully maintain.

DRY-ROT OF TURNIPS.

SUGGESTIONS REGARDING CONTROL.

By A. H. COCKAYNE, Biologist.

THE dry-rot disease of turnips is caused by a fungus known as *Phoma napo-brassicae*, which affects the bulbs of swedes, turnips, and mangolds, causing their premature destruction. With turnips and mangolds dry-rot only causes rotting in bulbs that have been previously injured in some mechanical way, or have been affected by some other fungus or insect that has induced certain types of decay to occur, and in the case of these roots it therefore only hastens the rapidity of the rot which would occur, irrespective of infection. The infection of mangolds with dry-rot is rare, and has been noted only in the Auckland and Taranaki Districts. With turnips dry-rot is common in crops that have been seriously injured either with aphis or diamond-back moth. Turnips rarely have more than 2 or 3 per cent. of affected bulbs in regions where these insects are not troublesome. In the Taieri district in bad aphis years turnips are seriously affected, but in wet seasons they escape with a minimum of infection. In Southland and Wallace Counties, where aphis and diamond-back moth are never serious, yellow-fleshed turnips are never affected with dry-rot sufficiently to cause any great apprehension as to the future growing of the crops in those districts. These considerations regarding turnips are of importance, as they may have a strong bearing on the avoidance, by the use of suitable varieties, of extensive losses through dry-rot.

THE CASE OF SWEDES.

With regard to swedes, however, the position is very serious. In the first place, dry-rot can infect swedes irrespective of whether they are perfectly healthy or have been weakened by any means. In the

second place, infection becomes increasingly virulent on swedes from the end of June to the end of September. There are many districts where dry-rot is causing the swede crop to be quite unreliable, and complete destruction may occur if the crop is held over after the end of June. Thus in such districts (Southland is especially bad) the crop cannot be grown for the purpose for which it is really intended—the provision of supplementary feed to come in after the Aberdeen turnips have been exhausted and before the spring grass is well away. In localities where dry-rot is really bad swedes are generally all right if fed off before July. In Southland, however, yellow-fleshed turnips produce such large and reliable crops that they are almost exclusively grown for winter feeding, swedes only being used in the very late winter or early spring. The system of growing as few swedes as possible is regular in Southland, and has in certain instances been partly induced through fear of dry-rot.

In many parts of the North Island swedes are seriously affected with dry-rot, but as the spring growth is earlier they do not have to be kept so long. Again, in many parts of the North Island yellow-fleshed Aberdeens are not a great success, and swedes are made to take their place. Thus, in the North a large proportion of swedes being fed off earlier than in the South the dry-rot position is not so serious. In dairying districts in the North where complaints concerning dry-rot are frequent, substitution by mangolds is carried out, and is a decided improvement from an efficient farming viewpoint.

In Southland a good deal of misconception occurs as to the relative importance of swedes and turnips so far as area is concerned. I have reckoned that not more than 15 per cent. of the winter-feed area is devoted to swedes, so that turnips, which do not suffer to any great extent from dry-rot, are far and away the more important crop. Still, the abandonment of swedes would be serious, for, as already indicated, they are specially adapted for filling in that short period between the exhaustion of the Aberdeens and the spring growth of grass. It must be remembered, however, that certain districts—such, for instance, as Riverton—have virtually abandoned the growing of swedes for many years, and now rely almost entirely on yellow-fleshed turnips to carry through stock till the spring. It is quite a common remark of farmers to say, "Swedes are no good with me, and I have given up growing them." In nearly every case dry-rot has been the cause.

Now, if it is assumed that swede-growing (particularly in Southland) will have to be abandoned unless a method of controlling dry-rot is discovered, it is also feasible to expect that the work entailed by a scientific investigation of the disease and its incidence will be very great and must extend over a considerable time, all experience with other field-crop diseases being in this direction. It therefore appears that investigation into dry-rot should also be accompanied by an inquiry into the methods of farm-management in which no swedes are grown—in other words, that a substitute for the swede crop should be discovered. The substitution of crops is a matter that can be found out rapidly and easily by field experiment and demonstration, whereas in the control of the causative agents of field-crop diseases success has been obtained only in a very few instances.

INVESTIGATION WORK.

A certain amount of investigation work, both in field and laboratory, has been carried out by the Department with regard to dry-rot, and the results of practical significance can be summarized as follows :—

(1.) Infection appears earlier on early sowings than on late ones.

(2.) Crops with 20 per cent. of bulbs affected on, say, the third week of July may have 100 per cent. affected a couple of months later, in September.

(3.) Little loss is experienced with crops fed off before the middle of July.

(4.) All varieties of swedes so far experimented with appear equally affected.

(5.) Swedes following affected swede crops are affected at a younger stage than when grown on clean land.

(6.) Lime appears to delay infection.

(7.) Stored swedes covered appear to keep much better than when in the field. Earthing up bulbs stops infection.

An outline of suggested work is as follows :—

(1.) Investigation into the growing, utilization, and cost of production of crops to replace swedes in areas where dry-rot is prevalent. This work should include an investigation on enlarging of the feeding-off period of yellow-fleshed turnips by modifications in field and utilization practices, together with a thorough study of late-keeping varieties. It is quite probable that alteration in the time of sowing, selection of varieties, and adoption of pitting methods might enable yellow-fleshed turnips to replace swedes entirely. Then again, the question of employing other root crops, such as mangolds and carrots, to replace swedes, and the use of certain fodder crops, such as Algerian oats, should also be properly studied. In connection with this a proper economic study of the cabbage as a field crop should be made, apart from any dry-rot considerations, especially near large centres of population where winter milking is undertaken.

(2.) A proper study of the effects of different types of manuring, times of sowing, and susceptibility of different varieties of swedes to dry-rot.

(3.) A study of pitting methods for swedes done prior to the main winter outbreak of dry-rot.

(4.) A study of chemical methods of control, especially spraying, considered from the cost point of view as well as the most effective method of application.

(5.) The furnishing of full information regarding the situation to European seed-merchants who supply our swede-seed requirements, soliciting their co-operation in the production of the disease-proof varieties desired.

(6.) Local work in the raising of disease-proof varieties.

Personally, I am very strongly in favour of immediate attention being given to a consideration of farm-management factors that will do away with the necessity for swede-growing in districts where dry-rot

is serious. Something tangible should be secured rapidly in this way, and the lessons learnt could be put into operation until such time as either proper swede-management or a disease-proof swede were evolved, when swede-growing could again be undertaken as a general farm practice. From what work I have myself done I realize very clearly that the control of dry-rot in swedes requires much investigation and is not likely to be carried out by any simpler means. The farmer naturally will desire some method that costs virtually nothing and which does not alter his method of management, but it is very unlikely that such will be accomplished. One has only to consider the history of the control of any of our general farm crops to realize that alteration of management largely based on crop or variety substitution is the keynote of control of all diseases that are not preventable by seed-treatment. The question of dry-rot control from a practical standpoint seems, therefore, largely to consist of farm-practice considerations, and as such it is being taken up by the Fields Division. So far as the actual scientific work in connection with the fungus is concerned, more special consideration could have been given to it by the Biology Section had the officer who has been specially trained in this branch not been recently called up for military service.

As mentioned, however, a good deal of work has already been done, and the results all point to crop-substitution methods as the most likely to be immediately effective. The only result that may or may not be of practical significance is that earthing up and storing swedes seems to reduce rotting to a very large extent. The feasibility of spraying is a point that should also be investigated, and it would not entail any difficult features. At present one dismisses the spraying idea as impracticable, even if effective, but such should be determined and not allowed to rest on mere opinion.

The Lantana Shrub.—Landholders both in New Zealand and the Dominion's Pacific island dependencies have been warned against the lantana (or viburnum ; natural order Verbenaceae, tribe Verbeneae), a tropical and subtropical shrub which has overrun large areas in certain countries. As regards New Zealand, it would appear that more knowledge is required before any action is taken. There are many species of lantana, and at present we do not know what species it is that is causing trouble. Although lantana scrub is spreading rapidly on some of the tropical islands and in Queensland it does not follow that such is likely to occur in this country. The lantanas growing in gardens in Auckland and elsewhere are highly ornamental plants which it would be a distinct loss to class as noxious weeds. Moreover, it is not possible for them to become so except in a comparatively limited area, as the plant will not bear more than a very few degrees of frost.—*W. H. T.*

To the list of agricultural tractors represented in New Zealand, as published in the April *Journal,* may now be added the Parrett four-wheel tractor, an American machine, for which Messrs. John Burns and Co., of Auckland, are the sole agents in the Dominion.

THE "HAND" HIVE AND SYSTEM OF BEE-MANAGEMENT.

By A. B. TRYTHALL, Beekeeper, Ruakura Farm of Instruction.

WHAT is considered the best experiment undertaken at the Ruakura apiary during the last two seasons has been a test of the "Hand" system of working bees for honey and increase. This system is based on a special floor-board invented by Mr. J. E. Hand, of Birmingham, Ohio, U.S.A., and described in his book entitled "Beekeeping by Twentieth-century Methods." An epitome of the system is also given in the "A B C and X Y Z of Bee-culture" (1913 edition), certain portions of which are embodied in this article.

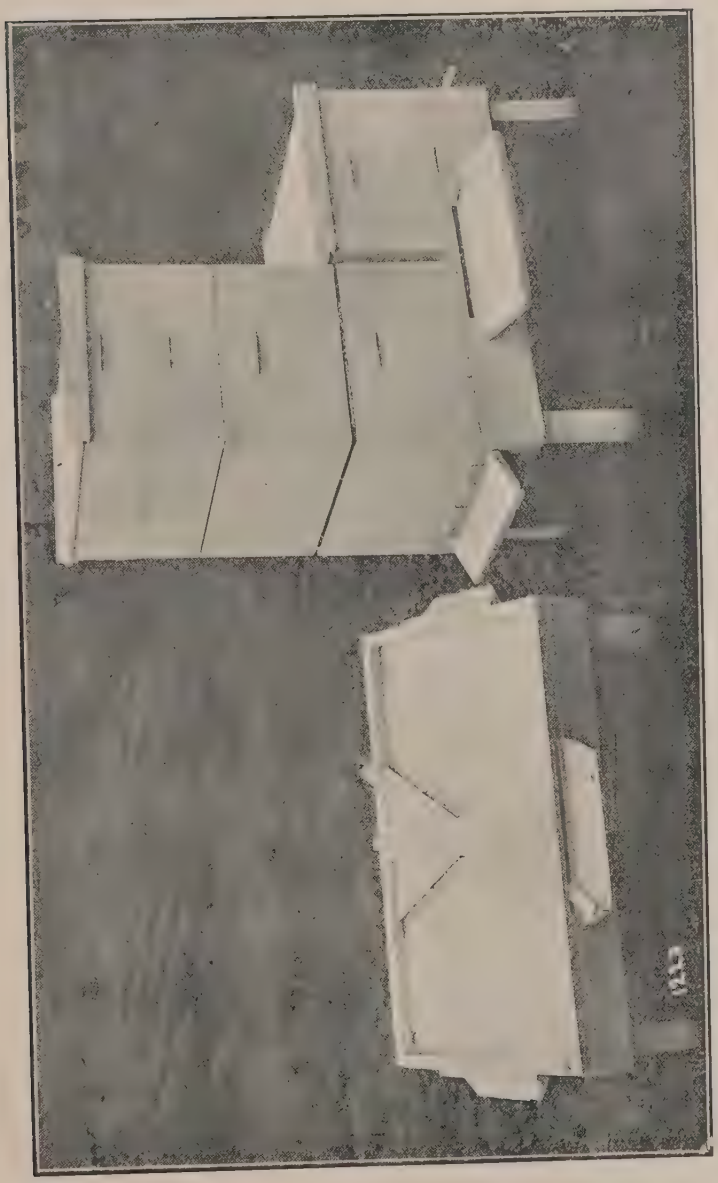
One great advantage of the Hand system is that the floor-board is the only part that differs from the beekeeper's ordinary plant, so that all other appliances fall into line without any alteration whatever. This floor-board (shown in the accompanying illustration) is of double width, capable of taking two hive-bodies side by side. There are entrances on all four sides; those at the front and back can be manipulated by means of a pivoted switch or lever in such a way as to throw the flying bees into either right or left body-boxes at will, the sliding-lever closing the entrance to one side as it opens the other. The entrances at each end are auxiliary only.

THE SYSTEM EXPLAINED.

To explain the system of management we will presume that a stock of bees has been placed on the left side of the Hand floor-board with the switches arranged so that the flight entrance is at the front. We will suppose also that the ordinary spring management has brought the hive up to full strength as early in the season as possible. By about the end of October in the Waikato district the bees should be strong enough to have fairly well filled a super in addition to their brood-chamber, and preparations for swarming might be expected at any time.

From about this time the Hand system of management really commences. It consists of four separate operations extending over the following six to eight weeks, and for ease of reference in describing these operations we will refer to the hive on the left side of the floor-board as "No. 1," and that on the right side as "No. 2"; the main entrances to either hive as "front" and "back" respectively, and the auxiliary entrances as "left" and "right." Details of the four manipulations are as follows:—

(1.) On a fine day when bees are flying freely and numbers will be out in the fields remove super from No. 1 and place it on right side of floor-board (No. 2), and exchange the central comb for a comb of brood and bees, including the queen from No. 1; put on No. 2 a queen-excluder and a super of empty combs, and close the hive. Next throw over the front switch, thus in one operation closing the entrance to No. 1 and opening one leading to No. 2. This is done without



THE "HAND" HIVE: ON LEFT, FLOOR-BOARD ALONE; ON RIGHT, HIVE-BODIES IN POSITION. (PHOTOGRAPHED AT RUAKURA.)

changing the appearance or position of the outside entrance, which is always open full width. The returning field-bees will enter No. 2 without any hesitation and through their accustomed entrance, thus causing no disturbance, and finding there their own queen and a small brood-nest with plenty of available space they will settle down immediately to hard work. Now throw the switch at the back to provide a new entrance to No. 1, which has been so smoothly robbed of its field-bees, and which is now given a young laying queen to take the place of the one removed to No. 2.

(2.) In about eight to ten days' time examine No. 1, and see that the young queen has been accepted and is laying freely. If the hive is very full of bees, which it probably will be owing to the continuous hatching of young bees, again throw over the back lever, thus drafting the flying-bees to No. 2, into which they will run as though nothing had happened. This will usually settle the swarming question during the honey-flow. Both switch entrances to No. 1 being now closed, we open the auxiliary entrance at the left-hand end. Both hives can now usually be left from four to six weeks without attention other than the giving of additional super accommodation if needed.

(3.) At the end of a month to six weeks (which in the Waikato would probably be about the middle of December, and therefore the usual time for the commencement of our honey-flow) the condition of the hives would most likely be as follows: No. 1 would have brood-nest full from side to side, with abundance of bees and headed by young queen. No. 2 would have full brood-nest under excluder, with abundance of bees, and headed by the old queen, who would now be all the better for a little rest. Honey would probably be coming in nicely to the super or supers above. We now remove the excluder and supers from No. 2 and place them over No. 1, and on the top of all place an additional empty super, into which are placed all the frames of brood and bees from No. 2, with the exception of two with adhering bees and queen, which are left behind. Now close No. 1, and throw over both front and back switches, closing entrance to No. 2 and drafting the full force of field-bees from both hives into No. 1. Now, returning to No. 2, which we left with old queen and two good frames of brood with plenty of adhering bees, fill in the hive with eight empty combs and close up, and, as both switch entrances have been closed, open the auxiliary entrance at right end.

(4.) Eight days later examine the eight brood-frames transferred to the top chamber of No. 1, and cut out any queen-cells that may have been formed there.

In all these manipulations a careful watch must be kept to see that a supply of stores is always present in each half, so as to provide against any possible dearth of nectar from outside.

CONDITION OF THE HIVES DESCRIBED.

The hives may now be described as follows: No. 1, having a young queen who has laid comparatively few eggs, will not be likely to cast a swarm, especially as it has a double entrance (front and back), and an end entrance on the left, aided by a 1 in. space under the frames, making about the strongest combination imaginable for the prevention of swarming. In addition to its own brood-nest under excluder, it has any number up to eight frames of brood in its top story, the bees

of which, when hatched, will provide an extra army of honey-gatherers. It also has all the flying-bees from both No. 1 and No. 2. Therefore, with such an enormous population just as the main honey-flow is coming on, and with only one brood-nest proper to maintain and attend to, it should be able to store the maximum amount of honey obtainable, and should require no further attention during the season other than to be kept well supplied with abundance of super accommodation. No. 2 is practically a nucleus hive, which should without difficulty build up by the end of the season into a good colony with plenty of stores to winter on. The old queen, after having had strenuous spring work, is forced to take a semi-rest, and therefore should be equal to good work another year; but should there be a spare young queen on hand at any time it would be easy to supersede the former if thought fit. This hive gives the 100-per-cent. increase with little labour. When the bees are resting in winter it can be moved to a new stand of its own. Should, however, no increase be desired it is a simple matter, at the third manipulation, to kill the old queen and put her whole brood-nest on top of No. 1, instead of reserving the two frames of brood for increase as before arranged. It is necessary to add that the periods given for the various manipulations are only approximate; every beekeeper must be guided by the conditions of his own district and its flora.

THE ADVANTAGES SUMMARIZED.

I may now sum up the advantages of the system generally. The manipulations are few, easy, and cause the minimum of disturbance to the bees. Swarming is prevented by a simple definite process. My thirty years' experience in bees has provided me with no other way of swarm-control nearly so effective or easy. Perfect control of bees is obtained. If in spite of everything (as will sometimes happen) any colony shows preparations for swarming, they can be frustrated by switching the flying-bees over to the other side. Any system whereby the progency of two queens laying prolifically for six weeks just prior to the main honey-flow can be made to work in conjunction throughout the flow with only one brood-nest to look after should appeal to any beekeeper. If choice natural queen-cells are wanted it would be difficult to produce them under better conditions than those cut out at the fourth manipulation. In fact, a bar of queen-cells with choice larvæ put between the brood-frames on top of No. 1 at the third operation (or following day for preference) would be started under ideal conditions. Our best batch at Ruakura during the past summer was produced in this way.

With the Hand method there is no spilling of nectar on the ground, no incentive to superabundance of stings, no possible loss of queens or clustering of bees with their queen under the floor-board—all of which are likely to happen when "shook" swarming is carried out. When bees are switched over from one side to the other they enter without hesitation, and no time is lost by them in getting accustomed to their new surroundings. This, if a honey-flow is on, may mean a considerable gain in honey in favour of the Hand system over methods in which the position of the entrance is changed, or where the bees are shaken or otherwise roughly treated, throwing them into abnormal condition.

Another strong point is that the brood in one half is held in reserve to reinforce the other half, one hive being a storehouse for honey and the other a nursery for the reinforcements of young bees—both being connected and under complete control. The last but by no means the least advantage to be gained is in the establishment of an easy, definite system of work that can be applied to any strong hive. The writer, like many other beekeepers, can look back on years of experimenting to find a system of work to suit himself and his district, while a clear-cut method of procedure, like the Hand system, would doubtless have saved much worry and labour and have produced far better returns in honey.

COMPARISONS WITH OTHER METHODS.

Before concluding I may compare the Hand system with the various other leading methods used by prominent beekeepers here in New Zealand—not so much to show wherein it differs from them, but rather how it gathers up and appropriates to itself the good points of them all. Many apiarists adopt the shake-swarm method, but surely the first manipulation of the Hand system accomplishes the same result in a much simpler way! One of our former presidents of the National Beekeepers' Association (and a president is usually a master of the craft) gives, I believe, a second shake, but the Hand gives at least two and a half. Others remove frames of brood more or less weekly above excluders, or scatter it through the supers without using excluders. The Hand system not only moves brood, but switches the bees after it. Some take the brood and distribute it amongst other colonies. How easy, even in careful hands, thus to convey foul-brood at the same time should the enemy be lurking in the district! The Hand hive is self-contained all the time. The ripened experience of our largest beekeeper in the Waikato has developed a system by which he introduces a young laying queen into his hives early in December, just as the main flow from white clover may be expected. He argues that the old queen is on the decline, having spent her energies during the long spring and manuka-nectar gathering, and needs a rest. The new queen gives vim and population to the hive. He holds that no colony does its best at two crops if headed by the same queen. The reasoning is sound; the heather-honey producers at Home and some prominent American apiarists say the same. Truly the Hand scores heaviest of all here, for it is the young queen and her progeny that attack the main flow, but with the further help of nearly all the old queen's brood-nest and bees thrown in.

OBJECTIONS ANSWERED.

The advantages of the Hand system being so many, has it no disadvantages? I have only heard one mooted namely, that when the flying-bees were switched away many larvæ would perish for want of the necessary water for the nurse-bees' use. I have not proved this to be so, but there is scope here for detailed experiment. Even if it is true there are two remedies, both of which I have used, I believe, successfully. One is to fill a comb with water from under a tap and put it in the hive in place of the one taken out with the queen at the first manipulation. The other is to open the back switch a week before the first operation in order to tempt a few bees to get used to that entrance beforehand and so be able to act as water-carriers when

wanted. It may be asked what would happen if the bees swarmed just before one was ready to commence the treatment. That did happen to me once (the fault was my own, of course), but the remedy was absurdly simple. The queen, being clipped, was picked up, caged, and placed just inside No. 2 entrance. The switch-lever was thrown over, thus closing No. 1 and opening No. 2, and the swarm on returning to their old entrance were drafted straight into their new home to their queen, and the first Hand manipulation had practically been performed with even less work than usual. The back entrance to No. 1 was opened after the swarm had settled down, the super transferred to No. 2, queen-cells were cut out of No. 1, a young queen was given, and all ended well.

APPLE-TREE ROOT-SYSTEM REVEALED BY FLOOD.

WHEN dealing with orchard cultivation, manuring, and intercropping any information on the actual position of the roots of the trees is of value. Considerable light was thrown on the subject by a flood at Brightwater, near Nelson, in March last, which washed out a 4- or 5-acre block of seven-year-old apple-trees of the Delicious variety. The orchard was situated just below the terrace on a river-bed, the soil consisting of 18 in. to 2 ft. of loam on a shingly subsoil. In some

THE WASHED-OUT APPLE-ORCHARD AT BRIGHTWATER.
Showing extent of main roots of seven-year-old Delicious tree.

places the flood washed away the soil altogether, in others the soil was washed away to the depth of the plough-sole. As a result the root-system of the trees was revealed, showing most of the main roots radiating horizontally some 8 in. or 9 in. below the normal surface for a distance, on the average, of 21 ft. An examination of the plough-sole showed it to be a perfect network of hairlike apple-roots over the whole surface. The remarkable spread of the main roots is shown in the accompanying photo. The trees are of the usual type, 6 ft. to 7 ft. high, and planted on the square at a distance of 18 ft.—*W. C. Hyde, Orchard Instructor, Nelson.*

CANTERBURY SEED-GROWERS' ASSOCIATION.

THE FIRST THREE YEARS' WORK.

By F. W. HILGENDORF, D.Sc.

In 1910 the Canterbury Agricultural College, at Lincoln, commenced a systematic attempt to produce improved strains of the wheats commonly grown in New Zealand. By 1915 a pure strain of the variety known as Hunters or Red Chaff had been isolated and put through exhaustive trials, which demonstrated its superiority over the best seed that could be bought on the market. The strain was then offered for sale under the name of College Hunters, and was distributed in lots of 10 bushels or over at a price about 1s. per bushel in excess of that of milling-wheat at the time. The great interest felt by farmers in a pure strain of one of their favourite wheats was evidenced by a large demand for seed, and it became obvious that the College farm could not supply enough seed to satisfy all inquiries. On the other hand, it was equally evident that if the seed of the pure strain were sown and threshed by farmers in the ordinary course it would soon become so mixed as to lose a great deal of the advantage of its original purity.

In this difficulty it was decided to attempt the formation of a seed-growers' association, somewhat on the model of the one that has for many years been so successful in Canada. Half a dozen farmers interested in pure seed met in Christchurch, and the association was formed under the presidency of Mr. J. Grigg, of Longbeach. It was decided that each member should procure a stock of pure seed from the College or any other source, and arrange to keep it pure by going through an acre or two of the standing crop just before harvest and roguing out any impurities in the shape of weeds or undesired varieties of grain. He would then first thresh the bulk of the paddock of the variety, so as to remove from the threshing plant impurities carried in it from other fields, and afterwards thresh his purified area for the purpose of keeping up a supply of pure seed for his own use. It might be expected from this that each grower would save, say, 50 bushels of purified seed, which would sow 30 or 40 acres. The whole of this field would now be practically pure, but the grower would again rogue an acre or two to provide pure seed for his own use and sell the rest (say, 700 or 800 bushels) to any inquirers.

In order to secure the carrying-out of these plans and to make sure that seed offered in the name of the association was pure enough to preserve its original reputation, it was felt that some kind of official inspection was necessary. But it was at once seen that any form of inspection would be somewhat costly owing to the considerable distances to be travelled, and owing especially to the fact that all the travelling would have to be done within the space of a week or two—not when trains, &c., suited, but when crops were nearly ripe. Financial assist-

ance was therefore sought from the Department of Agriculture, and owing to the sympathetic attitude adopted by the Minister and by the Permanent Head of the Department a sum of up to £100 per annum for three years was provided to defray the travelling-expenses of the inspector appointed by the association. The annual expenditure has absorbed only about one-third of the grant.

The writer of this article was then appointed honorary secretary and inspector, and attempts were made to get into communication with all the farmers who had bought pure strains of seed from Lincoln College, and with every one else who had seed that he considered pure enough for sale, special attention being directed towards all those who exhibited seeds of grasses or cereals at agricultural shows. Every opportunity was taken to mention the scheme at meetings of farmers, and its explanation always met with considerable interest and approval. Most of the interest, however, came from the side of prospective purchasers, who were delighted at the chance of being able to know where they could purchase reliable seed. Those who would undertake to produce the seed were, however, not nearly so numerous, and, as a matter of fact, the membership of the association has never exceeded nine. None of these has yet worked up a pure strain of his own, though Mr. H. M. Anderson, of Waikari, is in process of doing so. All the others have dealt with strains of wheat provided by Lincoln College, except one who happened to have on hand a crop of Solid-straw Tuscan pure enough for registration, which he has kept pure by roguing.

To return to the procedure followed by the association: The member, having just before harvest purified his acre or two to provide himself with seed for the next year, wires to the inspector, who examines the crop while standing, and if he is satisfied that the rogued area is sufficiently clean, and that the bulk of the crop is pure enough for general use, issues tickets in the following form, the number of tickets being based upon the area of the crop and a conservative estimate of the yield:—

CANTERBURY SEED-GROWERS' ASSOCIATION.

SEED OF .....

WHEAT

Harvested 191

GROWN BY

I certify that I inspected the enclosed seed while growing; that it is true to name, relatively pure, and free from noxious weeds.

Hon. Insp. to the Assn.

About two-thirds of the crops inspected have been accepted as fit for registration.

As a general rule the honorary secretary has then inserted a notice in the newspapers of the wheat-growing districts that the various growers

had seed-wheat of given varieties for sale, and the growers have made their own arrangements with all inquirers, charging what price they wished—generally about 1s. per bushel above milling-price. During the present season, however, all wheat produced was purchased by the Government at a fixed price, and this would have resulted in all the pedigree seed wheat being sold in bulk lots to the millers if it had not been for the action of the President of the Board of Trade and the Wheat Controller. They made an arrangement whereby growers of certified seed were enabled to secure some increased price for their seed, so that the production of it in future years might be encouraged. For this action all wheat-growers render hearty thanks. The Minister of Agriculture has further shown his interest in this work by renewing the grant for the travelling-expenses of the inspector for another three years.

As a rule the whole of the seed produced has found ready buyers, the amount changing hands being about 3,000 bushels each season. This year, however, the production was larger, while the demand for certain varieties was becoming satisfied by purchases in past seasons, so that some hundreds of bushels have remained on hand.

Before concluding it is necessary to remove two misapprehensions that are commonly found in regard to the certified wheat. Firstly, the seed is not necessarily machine-dressed. Almost any wheat may be made to look well by screening it, but the goodness of the certified wheat lies in its purity, not in its looks. Purity can be judged only on the standing crop, and therefore it is on the standing crop that the certificate is issued. Secondly, the certificate means no more than it says. The seed will not necessarily give a better crop than ordinary seed, unless it is certified seed of a tested strain.

The isolation and testing of pure strains is a work undertaken by the Canterbury Agricultural College, not by the Seed-growers' Association; but as it is these strains that the association has mostly dealt with some particulars of their performances are appropriate here.

RECORD OF COLLEGE HUNTERS.

Harvest.	College Strain.	Commercial Seed.	Remarks.
1911 ..	5th best plant in 1,000	..	..
1912 ..	118 per cent. ..	100 per cent. ..	..
1913 ..	108 ,, ..	100 ,, ..	..
1914 ..	63 bushels per acre	50 bushels per acre	Five plots of ½ acre each.
1915	64 ,,	56 ,,	Ditto.
	40 ,,	29 ,,	12 acres each.
	27 ,,	25 ,,	Field at Rakaia.
	26 ,,	20 ,,	Field at Kirwee.

In 1916 the College strain was distributed to thirty-three growers, of whom twenty-five reported trials evidencing superiority of strain over their own seed. A miller reported, "Best sample of Hunters I have ever seen."

In 1917 and 1918 the College strain was grown by hundreds of farmers with general satisfaction, and gave on the College plots an increase of 4 bushels per acre in excess of the commercial seed.

RECORD OF COLLEGE SOLID-STRAW TUSCAN (D 40).

Harvest.	College Strain.	Commercial Seed.	Remarks.
1914 ..	115 per cent. ..	100 per cent. ..	Single row.
1915 ..	117 ,, ..	100 ,, ..	$\frac{1}{10}$ acre.
1916 ..	12·8 bushels per acre	13·8 bushels per acre	Drought and disease.
1917 ..	35·2 ,,	31·2 ,,	Five plots of 1 acre each.
1918	40·8 ,,	38·1 ,,	Three plots of 1 acre each.
	25·0 ,,	20·0 ,,	Field at Darfield.
	20·0 ,,	16·0 ,,	Field at Templeton.

RECORD OF COLLEGE PURPLE STRAW TUSCAN (D 4).

Harvest.	College Strain.	Commercial Seed.	Remarks.
1914 ..	108 per cent. ..	100 per cent. ..	Single row.
1915 ..	112 ,, ..	100 ,, ..	$\frac{1}{10}$ acre plot.
1916 ..	14·5 bushels per acre	12·1 bushels per acre	Five plots. Drought.
1917 ..	26·1 ,,	24·0 ,,	Five plots of 1 acre each.
1918	38·9 ,,	36·8 ,,	Three plots of 1 acre each.
	37·0 ,,	32·0 ,,	Field near Timaru.

RECORD OF COLLEGE PEARL (D 38).

Harvest.	College Strain.	Commercial Seed.	Remarks.
1914 ..	110 per cent. ..	100 per cent. ..	Single row.
1915 ..	122 ,, ..	100 ,, ..	$\frac{1}{10}$ acre.
1916 ..	23·9 bushels per acre	18·3 bushels per acre	Five plots. Drought.
1917 ..	25·1 ,,	17·3 ,,	Five plots of 1 acre each.
1918	33·8 ,,	32·6 ,,	Three plots of 1 acre each.
	35·0 ,,	30·0 ,,	Field at Ashburton.

Mr. J. W. Harding, of "Mount Vernon," Waipukurau (who recently went into camp as a volunteer), has generously presented to the Department of Agriculture his imported Clydesdale stallion Dunrod Sensation. This animal is by the well-known Aberdeenshire-bred horse Lord Leith, a son of the great unbeaten Everlasting. It is of interest to note that at the recent Banks dispersal sale in Scotland six of the twenty-four horses put under the hammer were sons of Everlasting, and one of them, Merlin, obtained the second-highest price—1,350 guineas—the six averaging £626. The dam of Dunrod Sensation is by Goldmine, who is by the noted sire Goldfinder. Dunrod Sensation has been placed at the Department's Ruakura establishment.

KUMARA-CULTURE.

By J. H. DAVIDSON, Manager of the Tauranga Horticultural Station.

THE sweet potato (*Ipomoea batatas*) is a trailing vine belonging to the Morning Glory family and to the natural order of Convolvulaceae. The origin of the sweet potato, or kumara (to use the common Maori name), is unknown, but the plant is supposed to belong to tropical America. The edible tuberous roots are each year becoming a more staple article of food in New Zealand, especially in the northern districts, this being probably due to the large proportion of failure in the potato crops of the past three seasons.

The varieties of sweet potatoes differ greatly in habit, the Bermudas producing long trailing vines, while Nancy Hall, Porto Rico, and Vineless are bushy. The leaves of the plant are also exceedingly variable, usually ovate-cordate, with the margins entire to deeply lobed. The tubers of some roots are borne closely together under the crown, while in others they are found 2 ft. or 3 ft. away. The cultivation of the kumara is confined chiefly to the northern portions of the Dominion, and it is not advisable to plant on a commercial scale in any locality that is not favoured with a long growing season and a loose warm soil.

PROPAGATION.

In the month of August tubers of the previous season's crop are bedded to a depth of 4 in. in a well-sheltered and sunny position, but to ensure success a hotbed should be made, for if the spring be cold and wet the tubers are liable to decay. There is also a danger of having the young shoots cut off by late spring frosts. To make a hotbed it is necessary to have decomposing stable manure, which should be turned over several times before making up, then allowing five days to pass before putting in the tubers. An inch of clean sand should be spread over the bed, the tubers laid close together (but not in contact with each other), and then covered to a depth of 4 in. While a light sandy loam will answer the purpose, clean sand is preferable, as the tubers are not so liable to decay should they be kept too moist. Great care should be exercised in watering, it being safer to keep them rather on the dry side.

A cold frame differs from a hotbed only in lacking artificial heat; it depends entirely upon the sun. The frame need not necessarily be covered with glass sash—a good calico will answer the purpose very well. In four or five weeks' time the buds will have sprouted, and when the young shoots are 6 in. in length they are carefully removed by drawing the shoots with one hand and holding the tuber in position with the other. If this operation is carefully performed the sets will have roots enough to sustain them. They should then be heeled closely in a well-sheltered and sunny position, and provision made so that they may be readily covered with scrim or old sacking should there be any danger of frost. This method has a great advantage over the system so often practised of drawing the sets and planting them out right

away. It not only serves to harden off the sets, but they make roots which stand to them when they are planted out should it happen that the soil be dry.

Whether medium-sized and even-shaped tubers are best to propagate from is a question often asked. No opinion, for or against, will be given here on this point, but it may be mentioned that the experience of the Tauranga Station does not indicate any noticeable advantage from such selected tubers. A number of cuttings are made and rooted each year, and set out by themselves; the tubers from these seem to be more even, but the difference is slight.

SOIL AND MANURING.

A light sandy loam is best for kumara-culture; stiff and cold soils should be avoided. It is said that the plants are impatient of humus. This may be right, but I cannot vouch for it. They evidently grow well enough in the Tauranga soil, which is comparatively lacking in humus. Two seasons ago two plots of kumara-plants were set out at this station. No. 1 received a liberal dressing of nightsoil, while No. 2 was treated with basic superphosphate at the rate of 4 cwt. to the acre. When the crops were lifted the yield on No. 1 plot was a half heavier than No. 2. The plants are gross consumers of nitrogen, and as nitrogenous fertilizers are expensive and difficult to procure at the present time legumes should be grown and ploughed in. The kumara crop was grown last season on land where lupins were turned in three months previous to the setting-out of the plants. The tubers turned out large, but there were on an average only three good ones per plant, instead of the usual five or six. The extremely wet season probably accounted for this, as the yields throughout the district were very poor, the plants having run to vines at the expense of tuber-production.

PLANTING AND CULTIVATION.

The land should be well worked, and the fertilizer sown and harrowed in a few days previous to planting. Ridges 2½ ft. apart should be thrown up, and although this procedure is not necessary it is a decided advantage when the tubers are being lifted, as some sorts root very deep, and digging without injury is difficult.

The best time for planting out is from the middle to the end of November, or even two weeks later according to the locality; the earlier the better, so long as all danger of frost is past. Set the plants 18 in. apart on the ridges. If the weather be dry water each plant, and if they are well rooted no further watering will be necessary. It is, however, best to arrange the planting immediately after a shower, which is a frequent occurrence at that season.

Sweet potatoes require little attention once the plants are established. Keep down weed-growth, and lift the vines at intervals during the season to prevent them rooting at the nodes, otherwise they will run to vines instead of roots; the handle of a rake will answer this purpose.

PESTS AND DISEASES.

Few crops are so free from blights as the kumara. The only pest I have found on the plants here is a large green horned caterpillar, with eight oblique dark-coloured marks on each side, closely resembling

the tomato-worm in the United States, but it is a native species, *Sphinx convolvuli*. These caterpillars have not been numerous enough to warrant an arsenical spray, and they can be found readily by the eaten leaves and be hand-picked.

LIFTING AND STORING.

Location will govern the time for digging. It should be left as late as possible, but the work must be completed before there is any frost, otherwise the tubers immediately under the crown are liable to injury. Cut the vines off close to the crown, and use a broad-tined fork for digging, taking great care not to injure the tubers in any way. They should be handled just as carefully as fruit, for if they are broken or even slightly damaged they will not keep, and such roots should be put aside for immediate use. The reason why many fail to keep kumaras any length of time is due to faulty handling, and storing before they are thoroughly dried. Before putting them into the store they should be gathered into heaps and sweated for a week, covering them every night with their vines or old sacks. Damaged ones which may have been overlooked will then have begun to decay, and these can be thrown aside.

The sound tubers can be stored in a pit or in dry sand, both methods having their advantage. In digging a pit it is advisable to select a level site at some little distance from all buildings, as there is then less danger of rats becoming a nuisance. The pit should be 6 ft. in depth with an entrance of 4 ft. by 2½ ft. This will allow one to get in and out quite comfortably. After digging down to a depth of 2 ft. or so, according to the nature of the soil, tunnelling should commence and be gradually carried out until the required depth is reached, when a good-sized floor-space will be the result. The entrance should be boarded to save the sides being broken when getting in and out, and at one end the boards should be raised a few inches higher so that the water will run quickly off the cover, which should be a piece of galvanized iron, with a weight placed on top to keep it from blowing off. Before putting in the potatoes cover the bottom of the pit with a good layer of dry fern, so that the tubers will not come in contact with the earth. Ventilate the pit by removing the cover on fine days for the first three weeks. If all work has been carried out in detail the tubers will keep until next season's crop is ready to dig.

Kumaras can also be successfully kept by storing in sand or sawdust, but care must be taken to have the material perfectly dry. If a shed is available a corner of it can be boxed in, and every layer of tubers covered with sand. It is a good plan to use plenty of sand, as there will be less danger of rats getting at the tubers, for they cannot burrow in it. Separate boxes may also be used. This mode of storing is probably the most convenient for those who grow only a small crop chiefly for their own use.

VARIETIES.

The following are the varieties which are doing best at the Tauranga Station: Red and White Bermuda; Porto Rico; Nancy Hall; Southern Queen; No. 5964; No. 5955; No. 5954; Japanese; and Hutuhutu.

CERTIFICATE-OF-RECORD TESTING.

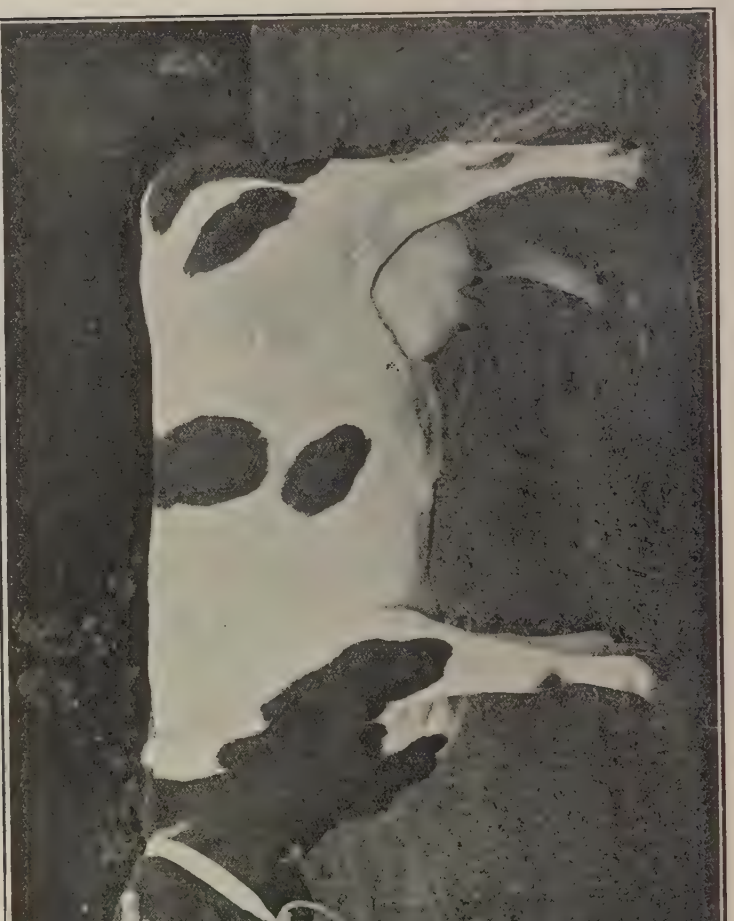
LATEST LIST OF COWS.

By W. M. SINGLETON, Assistant Director, Dairy Division.

THE appended list gives particulars of cows which have received certificates from 1st January until the end of July of this year. Comment has been made in previous issues of the *Journal* on the records of Woodcrest Johanna Tehee and Westmere Princess Pietertje, and a photograph of the last-named champion is here reproduced. This photo was taken shortly after the cow calved, and therefore does not do her full justice.

LIST OF RECORDS—1ST JANUARY TO 31ST JULY, 1918.

Name of Cow and Class.	Name and Address of Owner.	Age at starting Test.	Fat req'd. for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
	FRIESIANS.	Yrs. dys.	lb.		lb.	lb.
Senior Two-year-old.						
Mutual Fannie Vale Cynthia	W. Barton, Featherston	2 281	268·6	364	11,239·00	384·46
Mutual Pontiac Althea	,, ,,	2 325	273·0	364	9,004·20	294·95
Senior Three-year-old.						
Westmere Netherland Pauline	John Donald, Westmere	3 272	304·2	326	19,129·70	631·46
Westmere Netherland Princess IV's Daughter	,, ,,	3 270	304·0	285	14,305·30	505·24
Junior Four-year-old.						
Westmere Princess Pietertje	John Donald, Westmere	4 156	329·1	365	24,199·00	939·78
Friesian Countess Segis	W. I. Lovelock, Palmerston North	4 83	321·8	365	16,425·90	534·19
Canadian Ormsby ..	Ditto	4 65	320·0	364	12,870·00	427·86
Senior Four-year-old.						
Woodcrest Johanna Tehee	John Donald, Westmere	4 325	346·0	365	21,483·10	754·96
Pride of Gowan Lea	Cluny Friesian Farm Company, Wellington	4 296	343·1	365	9,527·80	355·91
Mature.						
Colantha Lass of Conemaugh	W. I. Lovelock, Palmerston North	5 132	350·0	365	15,391·10	604·48
Bainfield Nancy ..	W. D. Hunt, Invercargill	6-7yrs.	350·0	365	14,213·10	547·71
Beauty Lee ..	A. S. Elworthy, Timaru	5 343	350·0	365	15,583·30	543·86
Pearl Burke Pietertje V	W. I. Lovelock, Palmerston North	6 286	350·0	365	14,874·50	532·12
Millbrook Cordele ...	H. North and Sons, Omimi	5 145	350·0	365	16,432·70	521·24



WESTMERE PRINCESS PIETERTJE: NEW ZEALAND CHAMPION MILK AND BUTTER-FAT PRODUCER.

Age at start of test, 4 years 156 days; days in milk, 365; yield, 24,199 lb. milk, 939·78 lb. butter-fat; standard for class, 329·1 lb. butter-fat. Bred and tested by Mr. John Donald, Westmere, Wanganui.

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Name and Address of Owner.	Age at starting Test.	Fat req'd. for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
	JERSEYS.					
Junior Two-year-old.		Yrs. dys.	lb.		lb.	lb.
May Day's Favourite	Francis Dodunski, Inglewood	1 259	240·5	288	4,785·60	287·41
Trelawny Mignonette	T. B. Insoll, Hamilton	2 6	241·1	236	5,032·40	263·27
Petune's Combination	S. W. Shaw, New Plymouth	1 304	240·5	311	5,076·80	253·09
Senior Two-year-old.						
Te Mara's Zena Dare	C. A. Care, Cambridge	2 248	265·3	327	7,627·50	385·69
Whinflower's Pearl ..	F. E. Hellyer, Dunedin	2 192	259·7	365	7,039·80	363·46
Tree Lucerne ..	H. H. Phillips, Te Rehunga	2 273	267·8	271	6,871·40	340·25
Four-year-old.						
Wynotte	S. W. Shaw, New Plymouth	4 354	348·9	365	7,077·50	438·88
Patch I's Beauty ..	S. J. Bennett, Manaia	4 340	347·0	281	7,963·10	434·93
Duchess of Collingwood	F. E. Hellyer, Dunedin	4 72	320·7	352	6,053·60	349·74
	MILKING SHORTHORNS.					
Mature.						
Lilly	W. Brady, Woodville	13–14	350·0	365	13,567·50	590·34

PRESERVATIVE TREATMENT OF FENCING-POSTS.

A PARAGRAPHED statement has been going the rounds of the Press of the Dominion to the effect that a preparation of boiled linseed-oil and charcoal brushed over timber will preserve it from decay, and make fencing-posts — even of inferior soft-woods — practically everlasting in the ground. For general information it may be stated that none of the many works on the antiseptic treatment of timber refer to treatment with a paint of linseed-oil and charcoal. This would be effective only in so far as it prevented moisture from entering the post (moisture being necessary to wood-destroying fungi), and such treatment would be unlikely to be lasting in this respect for more than about three years. The brush treatment of posts, even with the most efficacious of all timber antiseptics—namely, high-grade coal-tar creosote—will only about double the life of fencing-posts. For example, a post that would last naturally for about seven years would, when properly treated by this preparation, last for some fifteen years. Even so, it is necessary that the post should be seasoned, barked, and well painted with the hot creosote at foot and for about 1 ft. above ground-level. An article entitled "Preservative Treatment of Farm Timbers," by Mr. E. Phillips Turner, which appeared in the September, 1915, issue of the *Journal* gave particulars of the creosote and other proved methods of treatment.

ROOT-GROWING IN MIDDLE TARANAKI.

EXPERIENCE AT STRATFORD MODEL DAIRY FARM.

By J. W. DEEM, Fields Supervisor, Wanganui.

Roots being the most important arable crop in the mid-Taranaki district, of which Stratford is the centre, the following notes on the subject, embodying the first year's experience at the Stratford Model Dairy Farm, will, the writer hopes, be of some use and interest to local farmers and others.

SOFT TURNIPS.

Soft turnips are required for late summer and autumn feeding—from the middle of January until the end of April. Taking 25 tons per acre as an average crop, it would be necessary to provide 1 acre for every seven or eight cows, or, in other words, 1 ton per cow per month. To have turnips ready for feeding early in January they require to be sown about the end of October. At the Stratford Model Farm during the past season Lincolnshire Red Globe, Red Paragon, and Purple-top Mammoth, sown on 29th October, were well grown and being fed to cattle in the middle of January, while Imperial Green Globe, Hardy Green Globe, and Romney Marsh, sown at the same date, were ready a month later. The three latter varieties, sown the first week in December, were ready for feeding by 1st March. This suggests that half the area required should be sown about the end of October and the remainder early in December.

In growing turnips to be pulled and fed to cattle it is important that varieties should be chosen that grow well out of the ground, so as to be easily pulled. At the Model Farm over twenty varieties were tested. Some of the yellow-fleshed turnips did well and gave heavy weighings, but being deep-rooted they are quite unsuitable for pulling. Summing up these experiments, it was found that Purple-top Mammoth, Red Paragon, Lincolnshire Red Globe, Hardy and Imperial Green Globe, Romney Marsh, and Thornburn's White Egg, gave the best results both as to weight and convenience of pulling. The first sowing should consist of half of one of the Red-top varieties and half of one of the Green Globes or Romney Marsh. In the later sowing the latter varieties should be used.

The Model Farm crop, which averaged 35 tons per acre, was grown with basic super and basic slag, half and half, for the first sowing; and basic super, two parts, and basic slag, one part, for the later sowing; at the rate of 3 cwt. per acre in each case. Both gave good results. At present 3 cwt. basic super per acre can be recommended with confidence.

There is considerable diversity of opinion as to the quantity of seed to sow per acre, and whether it should be sown through every coulter or through every second coulter of the drill. There is no doubt that on a well-prepared seed-bed 8 oz. of seed is ample, but for ordinary farm

practice it is safer to use from 10 oz. to 12 oz., and should the crop be on the thick side give it one or two strokes of the tine harrows when the plants are well established, or generally when they are a month old. Harrowing will thin the crop, and by loosening the surface of the soil weeds are destroyed and the remaining plants stimulated. Some experiments were conducted at the Model Farm to test the advantages or disadvantages of sowing through every coulter as compared with every second coulter. Every coulter gave slightly the heavier crop, but where the seed was sown through every second coulter the roots were better developed, and the present opinion is that every second coulter is the best for soft turnips. Further experiments will be conducted.

The following are the weights per acre, to the nearest hundredweight, of fifteen varieties grown at the Model Farm :—

	Tons.	cwt.		Tons	cwt.
Imperial Green Globe ..	37	8	Romney Marsh	27	15
Purple-top Mammoth ..	37	2	Fosterton Hybrid	26	13
Lincolnshire Red Globe ..	36	16	Waite's Eclipse	26	10
Hardy Green Globe ..	35	0	Favourite Purple-top ..	24	7
Thornburn's White Egg ..	33	1	Purple-top Aberdeen ..	21	16
Red Paragon	32	9	Green-top Aberdeen ..	21	11
Long-keeping Yellow ..	32	7	Model Green-top	21	0
Thornburn's Early American Purple-top	31	16			

SWEDES.

Swedes are required for winter (May to August) feeding, and about 1 acre to every six cows should be provided. Superlative, Monarch, and Magnum Bonum are the favourite varieties, and amongst these Superlative seems to stand out. In the Toko Settlers' Association competitions for several years Superlative has won all the prizes, and this result has been endorsed by the field variety tests conducted at the Model Farm this year, in which Superlative gave a weighing of 40 tons 9 cwt. of bulbs against the next best, Ne Plus Ultra, with 28 tons 2 cwt. In some small-plot tests (which did not include Superlative) Elephant, Monarch,* Keepwell, and Champion gave good results.

Superlative came into favour in Taranaki on account of its comparative immunity from club-root, and, while the variety is still fairly resistant in this direction when grown on new land, I have seen many badly diseased crops when sown on land that had grown swedes the previous year. Dry-rot was prevalent in all varieties grown on the Model Farm this year except Elephant, Superlative being among the worst for this disease. Experience has shown that from 10th to 20th December is the best time to sow swedes in the Stratford district, all the winning crops at the competitions having been sown between these dates.

As with soft turnips, opinions differ as to the quantity of seed to sow per acre, and whether the crop should be sown through every coulter or every other coulter. Summarizing the crops in the competitions one finds that the majority of the winning fields have been sown through every coulter, but many of the every-second-coulter crops have been close up. On new land it is probable that the sowing

* Elephant, Monarch, and Crimson King all represent strains of the same swede developed by different European breeders

through every coulter is to be preferred. My remarks on soft turnips as to seeding apply equally to swedes, and it is worthy of note that all the best crops in the district are grown with a seeding of between 8 oz. and 12 oz. At the Model Farm the main swede crop was grown with 8 oz. of seed sown through every second coulter, and the weight for bulbs (tops not weighed) was 40 tons 9 cwt. per acre.

About 3 cwt. of manure per acre seems a fair standard, and almost any of the phosphatic manures give fairly good results, especially mixtures of basic slag and bone, basic super and bone, basic slag and basic super, or basic slag or basic super by themselves. It will be noticed from the undermentioned manurial tests conducted at the Model Farm that basic slag, basic super, and equal parts of basic super, basic slag, and bone-meal, gave the best results. It must, however, be understood that an allowance of at least 5 per cent. either way must be made for experimental error arising from variation in soil and stand and from other accidental circumstances; and when this allowance is made the various 3-cwt.-per-acre dressings come out approximately equal in value judged by the effects produced. This is what one would expect from the composition of the manures used in relation to the requirements of the swede crop. As a general summation it may be said that a manure consisting to the extent of one-half of quick-acting phosphate rock, as in superphosphate and basic superphosphate, and one-half of the slower and steadier acting phosphate found in slag and Ephos and the various phosphatic guanos, is most suitable for the swede crop.

Swede Manurial Test at Stratford Model Dairy Farm.

Variety, Garton's Superlative; 8 oz. seed, sown through every second coulter, on 12th December, 1917.

No.	Manure.	Rate per Acre.	Cost per Acre.	Weight of Roots per Acre (Tops not weighed).	Cost of Manure per Ton of Roots.
		Cwt.	£ s. d.	Tons cwt. lb.	s. d.
1	Ephos	1	0 8 6	21 7 3	0 4½
2	,, ...	2	0 17 0	29 6 24	0 8½
3	,, ...	3	1 5 6	33 8 49	0 9
4	Faber Island guano	3	1 1 0	36 1 44	0 7
5	Surprise Island guano ..	3	1 1 0	34 4 85	0 7½
6	Super and Ephos, equal parts..	3	1 4 0	39 5 93	0 7¼
7	Super and slag, equal parts ..	3	1 2 10	34 11 8	0 7¾
8	Basic super and slag, equal parts	3	1 2 1	38 0 65	0 7
9	Basic super	3	1 1 0	40 7 34	0 6¼
10	Basic slag	3	1 3 3	40 6 64	0 6¾
11	Slag, bone-meal, basic super, equal parts	3	1 5 9	40 9 93	0 7½
12	Nil (control plot)	Nil	Nil	9 1 4	..

Club-root is spreading rapidly in the district, and acid manure such as superphosphate should not be used alone, basic super being relied on to take its place. Brassica crops should not be grown in succession, and only in absolutely unavoidable cases should swedes follow swedes. The same remarks apply to fields affected with dry-rot. When a field has become contaminated with club-root or dry-rot it should be limed and

sown down to pasture for at least five years. It should, of course, be understood that mangolds or carrots may be grown after swedes with good results, as the former are not affected with club-root or dry-rot.

MANGOLDS.

Mangolds are recognized as one of the best roots—if not the best—for dairy-farmers, and more are being grown in the district each year. It is hard to overestimate the value of a good stack of mangolds for feeding to the dairy herd as they calve during the period August to October, when pastures are bare. Another very important consideration is that if the cows are getting a good ration of mangolds they will not be so hard on the pasture, and the latter will get a chance to come away and strengthen, instead of being pulled out by the roots as is often the case under ordinary conditions. Given reasonable treatment mangolds can be grown successfully in Stratford district. At the Model Farm this year the average of the variety test was 46 tons per acre, while some of the better-doing varieties weighed up to 56 and 60 tons per acre, as will be seen by the following table.

Mangold Variety Test at Stratford Model Dairy Farm.

Sown 2nd November, 1917. Manure, equal parts bone-meal, slag, and basic super; 5 cwt. per acre. Cost, £2 2s. 9d. per acre, plus 4 cwt. salt at 2s. 3d. per cwt., 9s.—total, £2 11s. 9d. All varieties sown in drills 28 in. apart.

No.	Variety.	Weight of Roots (Tops not weighed).	Remarks.
		Tons cwt. lb.	
1	Sutton's Jersey Queen ..	46 6 77	Fly bad in early stages.
2	Cooper's Jersey Queen ..	35 17 68	,,
3	Sutton's Prizewinner ..	56 14 59	Splendid roots.
4	Garton's Prizewinner ..	56 1 100	,,
5	,, Yellow Globe ..	40 9 52	,,
6	,, Gate-post	19 9 14	Germination poor; roots good.
7	,, Long Red	56 9 51	Germination good; roots fair.
8	Cooper's Sugar	41 16 41	Rather uneven in type.
9	,, Golden Tankard ..	40 16 17	Nice roots; good quality.
10	Thornburn's Mammoth Golden Intermediate	50 15 86	Very nice mangold.
11	Evans Mammoth Saw-log ..	60 0 25	Nice mangold; splendid germination; red.
12	Thornburn's Giant Eckendorf ..	40 11 76	A bit uneven; yellow.
13	Steele Briggs Giant Yellow ..	56 6 56	Nice mangold; even.

In reviewing the foregoing test in conjunction with the results obtained in the various field competitions it may be accepted that Prizewinner, Jersey Queen, Long Red, and Sugar are the most suitable varieties for the Stratford district. Nos. 10, 11, and 13 promise well, but at present it may not be possible to procure seed of these varieties.

It is generally recognized that to ensure a good crop of mangolds the land should be ploughed early and deeply worked, this being important, as it conserves moisture and provides a good tilth for after-cultivation. The most successful time for sowing appears to be between 1st and 15th November on farms below Stratford, and any

time between the middle and the end of November on those between Stratford and Mount Egmont. Crops sown later than this do not produce any great weight, and are late in maturing.

The manuring of the mangold crop is very important, and it is generally considered that mangolds require a complete manure—one containing phosphates, nitrogen, and potash. There is no doubt that potash combined with phosphates is very beneficial, especially where the land has been previously cropped. Where mangolds are grown as the first crop after stumps it is not so important, as the ashes from the burning-off of the timber provide a fair amount of potash. In some cases nitrogen increases the crop, especially when applied in the form of nitrate of soda as a top-dressing after crop has been thinned. Tests were conducted at the Model Farm this year with sulphate of ammonia applied at the rate of ½ cwt. per acre when the seed was sown, but the results were negative, whereas nitrate of soda applied at the rate of 1 cwt. per acre when the crop was thinned increased the yield by 11 tons 7 cwt. Mangolds love salt, especially in inland positions, and where it has been used in the Stratford district the results have been beneficial. For instance, the winner of the Toko mangold competition used 3 cwt. of salt per acre, and at the Model Farm the use of 4 cwt. of salt per acre, broadcasted after the seed had been sown, increased the yield by 13 tons 9 cwt. Agricultural salt, like kainit, is at present almost unprocurable, but frequently the sweepings from hide-sheds are available and do quite well for sowing with this crop. At the present time the purchase of potash salts is out of the question, but most farmers could save a fair quantity by collecting the ashes after burning of timber, hedge-clippings, &c. Care should be taken to bag these before they get wet. When ashes are available from 3 cwt. to 5 cwt. per acre may be used. The main requirements are a good phosphatic manure applied at the rate of 5 cwt. per acre plus salt. The best results appear to have been obtained from combinations of super, slag, and steamed bone-meal, in equal parts (plus salt 3 cwt. to 4 cwt. per acre), and some of the proprietary mangold-manures at the same weight. The Model Farm crop was grown with equal parts of basic super, basic slag, and bone-meal, at the rate of 5 cwt. per acre, sown with the seed, plus 4 cwt. salt broadcasted after the seed was sown.

The best crops are those grown in drills 21 in. to 28 in. apart and where early thinning and plenty of after-cultivation is given. From 4 lb. to 5 lb. of good germinating seed in a properly prepared seed-bed will give a good strike. The thinning and after-cultivation is a great stumbling-block to the extension of the mangold crop, and where it is sown in close drills the cost of cleaning is high, but when sown in drills 28 in. apart, and once thinned, the bulk of the cultivation may be done by horse-labour. When it is considered that a man or boy with a horse cultivator will do from 3½ to 4½ acres in a day it will be realized that the cost is not prohibitive.

Mangolds require to be out of the ground at least a month before feeding, and the usual custom is to pull them in June, and stack them in heaps either in the paddock or in some convenient position for feeding out. Unless in very frosty positions no covering is required. Mangolds stacked in June are in good condition for feeding out in August, and should keep right through the spring. The minimum area grown should be 1 acre of mangolds for every twenty-five cows.

CARROTS.

Carrots do fairly well in the Stratford district, and the same manure as used for mangolds, at between 3 cwt. and 4 cwt. per acre, appears to give good results. Amongst the best varieties are Sinclair Champion, Matchless White, White Belgian, and Magnum Bonum. At the Model Farm varieties were grown in drills 28 in. apart; and Matchless White gave a yield of 31½ tons and Magnum Bonum 24 tons per acre, for roots only. In the Toko field competitions the winning crop was White Belgian, with a yield of 37 tons 2 cwt., this crop being sown in 14 in. drills and hand-cultivated. From 1¾ lb. to 2 lb. of seed is usually sown. At the Model Farm 1¾ lb. of seed was sown with the Duncan drill through the rape-feed, and the seeding was perfect.

SEED-TESTING NOTES.

By E. BRUCE LEVY, Biological Laboratory.

IN view of the restrictions on export from Britain it is highly probable that all available stocks of turnip, swede, and rape seed at present in store in New Zealand will be drawn upon for the 1918 and 1919 sowings. Importations are still arriving, but there is no doubt that much old stock will of necessity be put into use. The following table of germination-analyses, compiled from a consideration of 418 samples tested from April to July, gives a good indication of the germination capacity of the lines of turnip, swede, rape, and kale seed at present in store in the Dominion:—

	Minimum. Per Cent.	Average. Per Cent.	Maximum. Per Cent.
Turnips—			
Green-top Yellow Aberdeen	16	72·7	99
Purple-top Yellow Aberdeen	46	79	99
Purple-top Mammoth	43	83·7	97
Devonshire Greystone	39	75·3	98
Hardy Green Globe	29	57·25	93
Imperial Green Globe	12	87·7	99
Lincoln Red Globe	77	93·4	99
Forsterton Hybrid	68	90·75	99
Other varieties	30	70·6	94
Varieties not specified	14	83·5	100
Swedes—			
Magnum Bonum	31	57	87
Champion	12	73·7	94
Elephant	0	75	87
John Bull	40	75	93
Superlative	12	63·75	98
Crimson King	45	75·3	96
Other varieties	58	79	87
Varieties not specified	5	77·5	97
Rape—			
Broad-leaf Essex	18	87	100
Kale—			
Thousand-headed and Buda	2	55·5	92

NOTE.—The non-specified varieties of turnips are those in which the sender uses a distinguishing mark only. Included in these is a good number of garden varieties.

The great necessity for the farmer to know the germination of the seed he is sowing will be obvious from an examination of this table. With low-germinating lines, even if sown thickly, the danger of failure

TURNIP- AND SWEDE-SEED TESTING.

THIS photo, taken in the Biological Laboratory shows the relative vitality of high- and low-germinating lines of turnip and swede seed after sixty hours' test.

Nos. 701–711 are samples of a batch of newly imported lines (701–707, turnip; 708–711, swede).

The remaining samples are from a batch in store (Nos. 684, 685, 698, and 699, swede; 676, 677, 686–688, 693–695, and 700, turnip.

Photo by E. Bruce Levy.]

is great, for the vitality even of those seeds which do germinate is low, and consequently establishment of the plants is uncertain. The merchant will be loath to sell his client seed of low vitality, but if it comes to the worst and supplies are really short, then something must be done so that the low-germinating lines can be utilized with the least harm to the general turnip crops of the country. To mix high-germinating with low-germinating lines seems the most feasible thing to do. This would be preferable to selling each line separately, even if the germination certificate accompanied the seed sold. If even, say, 50 per cent. of a real good germinating (90–100 per cent) seed be included in a poor-germinating line the resultant take should be quite good. In the writer's opinion this would be the best course for merchants to adopt, even if it be necessary for them to buy high-germinating seed at a fairly high price. It will be obvious, of course, that the mixing should be done only with lines of one variety—Superlative swede with Superlative swede, for instance—and with seed from the same European exporter only.

Merchants should aim at as high a general germination as possible, and this should in no case be less than 70 per cent. The following table suggests a method of mixing which, while the germination of the resultant mixture would be quite satisfactory, enables much of the poorer seed to be utilized:—

Seed to be mixed.	Proportions of each to be mixed.	Germination of Resultant Mixture.
90% and 40% seed ..	70% of 90% seed with 30% of 40% seed	75%
90% and 50% seed ..	60% of 90% seed with 40% of 50% seed	74%
90% and 60% seed ..	50% of each	75%
90% and 70% seed ..	40% of 90% seed with 60% of 70% seed	78%
Alternative if a Higher Standard can be maintained.		
90% and 50% seed ..	80% of 90% seed with 20% of 50% seed	82%
90% and 60% seed ..	75% of 90% seed with 25% of 60% seed	82·5%
90% and 70% seed ..	70% of 90% seed with 30% of 70% seed	84%
90% and 80% seed ..	55% of 90% seed with 45% of 80% seed	84·5%
For the many Cases in which Lines of Higher Germination than 90% are available.		
98% and 40% seed ..	60% of 98% seed with 40% of 40% seed	74·8%

Seed lower than 40 per cent. germination should not be used for such mixing.

It must be borne in mind that the mixing of lines as a general practice is not for a moment advocated for normal conditions, but special conditions call for special actions, and if the shortage really becomes acute, then by adoption of the above methods the farmer should be secured against crop failures due to unduly low-germinating seed, while at the same time a supply equal to the requirements of all would be more readily available.

The only other method to ensure reasonable security for the farmer is for him to know the germination of the seed he sows, so that in the case of a low-germinating line a corresponding increase in the amount could be gauged and sown. Apart, however, from the factor of low-vitality seed, increasing the amount sown means a departure by the farmer from his usual procedure, and it is doubtful whether the exigencies of the moment would appear pressing enough for him to alter his established practice based on normal experience.

LIMESTONES OF NEW ZEALAND.

FURTHER ANALYSES.

By B. C. ASTON, F.I.C., Chemist to the Department.

SINCE the articles in the *Journal* for September and October, 1915, were published, embodying, so far as could be obtained, the information regarding the composition of the limestones of New Zealand at that date, a large number of samples have been received from various persons. These have been analysed in the Department's Chemical Laboratory, and the results are summarized in the following pages.*

It will be noted that in a number of analyses only the percentage of carbonate of lime is shown, while in others a fuller analysis is given. Although it is desirable that as full analysis as possible should be given in every case, it has become increasingly inexpedient to do this owing to the shortage of staff and pressure of other more important work. The fact that some samples are analysed more fully does not necessarily mean that they are any better than those others reported on. As to the value of analyses made on samples sent in by the general public and others unskilled in methods of sampling, it may be stated that although such samples may be misleading in cases, yet with the knowledge that too much reliance cannot be placed on the accuracy of the sampling and that the samples in extreme cases may not represent anything but themselves, the results of analysis still have a positive value. Should, for instance, a group of farmers decide on utilizing a stone containing, say, 80 per cent. of carbonate of lime, and on referring to these tables it is found that a sample from the district has been analysed containing 90 per cent., this may be news which would lead to a search for higher-grade stone and possibly alter for the better the site of the limeworks.

It must be borne in mind that now the cost of phosphatic fertilizers is so high, and some unobtainable at any price, the farmer has his alternative in liming more heavily, and thus making what phosphate there is in the soil more available. At the present time any original information which bears on limestone is therefore worthy of publication.

The writer again wishes to call attention to the desirability of utilizing the numbers of deposits of soft limestone, limestone ooze, or even cheap screenings from limestone-works, as top-dressings for land requiring carbonate of lime. Such forms of carbonate of lime can often be applied to the land without previous grinding or even bagging.

* Analyses of Wairarapa samples published in full in the November, 1915, *Journal* are not repeated here.

ANALYSES OF LIMESTONES.—NORTH ISLAND.

Results are given in percentages of carbonate of lime on samples as received.

(The number following a letter in parentheses is the Laboratory record.)

Mongonui County.—Awanui (H 169), 93·4, crushed shells. Komiti (J 662), 44·0, marl.

Hokianga County.—Kohukohu (H 141), 69·8, hard.

Bay of Islands County.—Hukerenui (H 144), 84·1, showing veins of calcite. Okaihau (H 711), 64·0; (H 712), 78·0.

Hobson County. — Mangawhare (H 45), 64·5, hard; (H 46), 68·4; (H 47), 74·4, hard; (H 48), 97·8, hard; (H 49), 92·2, hard; (H 50), 89·5, hard; (H 51), 82·0, hard; (H 53), 65·8, hard; (H 54), 96·7, hard; (H 87), 65·4. Mititai (J 185), 68·0, hard; (J 186), 71·0, hard. Mangawhare (J 683), 95·0, crystalline, hard; (J 684), 90·0, crystalline, hard; (J 685), 83·0; (J 686), 59·5; (J 687), 71·5; (J 688), 89·0, crystalline, hard; (J 689), 72·0. Dargaville (H 106), 64·2.

Otamatea County.—Taipuha (H 8), 75·4, soft. Araroa (H 180), 96·7, hard, crystalline. Whakapirau (J 334), 97·0, semi-crystalline; (J 335), 94·0, weathered stone.

Rodney County.—Wellsford (H 136), 72·7; (H 246), 78·8; (H 247), 6·9; (H 607), 79·9; (H 608), 78·5; (H 609), 71·6; (H 610), 68·2; (H 611), 46·4. Woodcocks (J 426), 74·0.

Waitemata County.—Swanson (H 217), 86·5; (H 218), 79·1. Redvale (H 307), 47·4; (H 308), 79·9. Kaukapakapa (J 34), 77. Dairy Flat (J 203), 53. Kaukapakapa (J 619), 70; (K 177), 80; (K 200), 72; (K 201), 69.

Eden County.—Orakei (H 160), 97·4; (H 161); 79·4; (H 162), 92·8; (H 163), 85·2; (H 164), 97·1. Auckland (J 197), 2·5, papa; (H 131), 98·2.

Manukau County.—Clevedon (G 382), 42·1. Papakura (H 302), 88·1; (H 303), 88·2.

Coromandel County.—Torehina Point (J 264), 98·5. Cabbage Bay (J 265), 81.

Raglan County.—Te Mata (J 398), 89; (J 399), 89; (J 400), 85. Raglan (J 297), 43; (J 298), 90; (J 299), 93. Waingaro (H 393), 21·8, hard; (H 394), 34·2, hard; (H 395), 70, hard; (H 396), 95, hard; (H 397), 75·8, hard; (H 398), 41·1, hard; (H 399), 90·6, hard; (H 400), 89·3, hard. Raglan (J 98), 87·1; (J 99), 86·1; (J 100), 85·9; (J 101), 74·4.

Waikato County.—Taupiri (H 241), 38·1; (H 263), 35·1, hard; (H 266), 37·8, hard; (H 267), 36·1, hard; (H 268), 41·3, hard.

Waipa County.—Hamilton (H 364), 81·3; (H 365), 89·2; (H 366), 95·7.

Kawhia County.—Kawhia (J 209), 95·5.

Awakino County.—Mahoenui (J 402), 71; (J 403), 96; (J 404), 98; (J 405), 98.

Waitomo County.—Te Kuiti (H 301), 96·1; (H 149), 52·5. Te Rauamoa (H 142), 98, cream crystalline, hard. Hangatiki (J 152), 70. Te Kuiti (J 267), 89. Aria (J 693), 49.

Taranaki County.—Inglewood (H 170), 67·7; (H 171), 46·6.

Whangamomona County.—Te Wera (J 229), 57·0; (J 230), 66·0; (J 231), 66·0. Kohuratahi (J 661A), 80·0, fairly hard; (J 661B), 77·0, fairly hard.

Stratford County.—Ngaere (J 607), 87·5.

Hawera County.—Hawera (H 66), 70·8; (H 123), 93·7; (H 124), 93·9; (H 125), 96·6; (H 126), 96·2; (H 127), 95·6.

Wanganui County.—Mataroa (J 616), 92·5.

Rangitikei County.—Taihape (H 340), 55·9, soft.

Pohangina County.—Apiti (H 329), 97·5, hard crystalline.

Kairanga County.—Palmerston North (G 824), 72·6.

Pahiatua County.—Pahiatua (H 233), 53·6; (H 234), 58·6; (H 235), 17·9.

South Wairarapa County.—Gladstone (H 173), 88·7; (H 174), 83·6; (H 175), 67·0; (H 176), 91·2; (H 177), 88·6; (K 182), 85·5; (K 183), 87·5.

Featherston County.—White Rock Station (J 97), 76·3.

Thames County.—Pipiroa (H 315), 92·7, shells.

Cook County.—Whakapunake (G 301), 48·6. Wairakaia (H 285), 69·1.

Tauranga County.—Te Puna (H 80), 83·1, sea-shells.

Wairoa County.—Tangitere (H 143), 73·4. Wairoa (H 298), 90·7; (H 299), 87·7.

Hawke's Bay County.—Poporangi (J 202), 89·0. Hastings (H 309), 82·9. Pakipaki (J 479), 81·0; (J 480), 89·0. Kereru (K 27), 84·0; (K 28), 73·5.

Waipukurau County.—Waipukurau (H 260), 39·8; (H 310), 15·7, calcareous sand; (H 311), 83·3; (H 312), 90·1; (H 313), 91·1; (H 314), 81·0.

Dannevirke County.—Whetukura (J 711), 86·0. Te Rehunga (H 70), 38·4, powder; (H 69), 84·1, hard.

Patangata County.—Omakere (H 297), 64·9.

Akitio County.—Pongaroa (J 174), 71·0; (J 175), 81·0.

ANALYSES OF LIMESTONES.—NORTH ISLAND—*continued.*

Laboratory No.	Locality.	Insoluble Matter (Sand, &c.).	Alumina and Iron Oxides.	Calcium Carbonate ($CaCO_3$).	Magnesium Carbonate, &c.	Approximate Yield of Quicklime (CaO) in Calcined Limestone.	Remarks.
		Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	
	Mongonui County.						
G 739	Awanui	79·40	4·40	12·70	3·50	..	
G 740	,, ...	58·70	3·90	33·30	4·10	..	
G 741	,, ...	92·40	1·00	5·60	1·00	..	
G 742	,, ...	44·30	1·10	53·30	1·30	..	
G 743	,, ...	40·20	1·40	57·60	0·80	..	
	Bay of Islands County.						
G 479	Ohaeawai	16·30	2·20	80·80	0·50	70	
G 481	,, ...	20·10	2·30	77·20	0·40	65	
	Hobson County.						
G 794	Mangawhare	34·95	2·70	57·46	4·89	43	
G 793	,, ...	4·34	0·98	94·25	0·43	90	
	Otamatea County.						
G 540	Paparoa	1·00	0·80	98·10	0·10	97	Very hard.
	Rodney County.						
G 462	Kaipara	7·30	1·30	90·80	0·60	84	
	Eden County.						
G 637	Auckland	25·00	3·20	69·10	2·70	..	Soft.
G 638	,, ...	15·40	2·70	79·60	2·30	69	Hard.
G 614	Hokianga	22·10	2·70	75·10	0·10	63	
G 615	,, ...	25·70	2·50	71·00	0·80	58	
	Manukau County.						
G 313	Clevedon	12·40	2·70	83·70	1·20	75	
G 314	,, ...	13·70	2·90	81·20	2·20	70	
G 315	,, ...	17·10	2·30	78·60	2·00	67	
G 316	,, ...	8·50	2·30	87·30	1·90	79	
G 380	,, ...	11·30	2·30	85·70	0·50	79	
G 382	,, ...	0·90	0·50	98·20	0·40	97	
	Raglan County.						
G 797	Karamu	4·50	1·90	92·90	0·70	88	
G 798	,, ...	7·10	2·30	89·50	1·10	83	
G 799	,, ...	12·30	2·70	83·40	1·60	74	
	Waitomo County.						
G 379	Putake	36·61	4·80	46·29	12·30	..	
G 320	Piopio	1·50	0·60	97·80	0·10	96	
	Egmont County.						
G 731	Opunake	2·70	20·0	92·60	2·70	..	
G 732	,, ...	1·30	1·20	92·00	5·50	..	
G 733	,, ...	3·60	6·90	87·20	2·30	..	
	Pohangina County.						
G 304	Apiti	43·70	2·30	50·40	3·60	..	Calcareous sandstone.
	Eketahuna County.						
G 545	Eketahuna	8·10	1·60	89·20	1·10	80·5	Kaiparoro; very hard.
	South Wairarapa County.						
H 603	Gladstone	5·60	1·10	85·30	1·10	86	Moisture, 6·9; very soft.
H 604	,, ...	1·00	0·50	96·40	2·10	94	Soft, friable.
H 605	,, ...	1·20	0·60	97·00	1·20	95	,, ,,
H 606	,, ...	13·30	2·70	82·40	1·60	72	Fairly soft.
H 607	,, ...	16·80	2·00	80·60	0·60	70	Shelly conglomerate.
H 608	,, ...	0·90	0·40	98·60	0·10	98	Very friable.
H 609	,, ...	4·70	0·90	93·70	0·70	89	,,
H 610	,, ...	3·40	1·10	94·10	1·40	90	Hard, containing calcite.
	Hawke's Bay County.						
G 825	Raukawa, Hastings ..	11·80	2·10	83·40	2·70	..	
G 826	,, ,, ..	14·90	2·20	79·80	3·10	..	
G 827	,, ,, ..	4·60	1·50	93·10	0·80	..	

ANALYSES OF LIMESTONES.—SOUTH ISLAND.

Results are given in percentages of carbonate of lime on samples as received.

Marlborough County.—Blenheim (H 635), 4·2; (H 636), 17·0; (H 637), 3·7.

Kaikoura County.—Kaikoura (H 263), 87·7.

Collingwood County.—Mangarakau (G 746), 59·4; (G 747), 68·2; (G 748), 57·3; (G 749), 67·7. Bainham (H 115), 67·2, hard; (H 116), 94·4; (H 117), 98·2. Ferntown (J 592), 93·0; (J 593), 98·5, pink stone.

Takaka County.—Takaka (K 101), 97·0; (K 102), 96·5; (K 103), 97·5.

Waimea County.—Kohatu (H 71), 85·7; (H 72), 94·5, hard; (H 73) 25·4, papa. Motueka (H 178), 79·5; (H 179), 92·7. Port Nelson (K 193), 99·0.

Buller County. Inangahua Junction (J 2), 83·0; (J 3), 40·1; (J 4), 86·4; (J 5), 71·8; (J 6), 89·3; (J 83), 73·5; (J 84), 73·9; (J 85), 73·0; (J 86), 69·6; (J 87), 69·0; (J 88), 81·8; (J 89), 74·8; (J 90), 74·3; (J 91), 80·1; (J 92), 66·8; (J 94), 73·0; (J 95), 74·0; (J 96), 67·3.

Awatere County.—Ward (H 17), 60·0.

Inangahua County.—Reefton (H 82), 79·3; (H 83), 68·7; (H 84), 77·3; (H 85), 75·5. Cronadun (H 276), 76·5; (H 277), 79·8; (H 278), 82·2.

Murchison County.—Murchison (H 28), 97·9; (H 29), 57·6; (H 30), 97·7; (H 31), 98·8; (H 32), 95·3; (H 33), 76·7; (K 134), 79·0; (K 135), 84; (K 136), 88; (K 137), 20; (K 138), 84; (K 139), 31; (K 140), 90; (K 141), 27; (K 142), 18; (K 143), 18; (K 144), 25; (K 145), 51; (K 146), 57; (H 227), 82·2; (H 228), 49·6; Tutaki (H 226), 4·1; Matiri (H 229), 53·8; (H 230), 55·6; (H 231), 64·2.

Grey County.—Greymouth (H 571), 91·8; (J 74), 82·9; (J 75), 74·6; (J 76), 75·0; (J 77), 75·3; (J 78), 79·5; (J 79), 80·1. Punakaika Creek (J 331), 94·0, hard; (J 332), 97·0, hard.

Westland County.—Ross (H 372), 70·1, hard. Kumara Junction (H 693), 2·4, papa rock; (J 151), 2·5, papa. Harihari (K 203), 95·0, soft calcareous sinter.

Amuri County.—Waiau (H 262), 73·0.

Selwyn County.—Springston (H 130), 79. Wairiri (K 7), 96; (K 8), 97; (K 9), 96; (K 10), 94.

Mackenzie County.—Albury (H 138), 71·7; (H 461), 54·6. Cave (H 606), 80·1. Fairlie (K 88), 49·0.

Waitaki County.—Awamoa (K 147), 87, soft; (K 148), 74; (K 149), 10, pebble.

Bruce County.—Lovell's Flat (J 462), 70·0; (J 463), 90·0.

Clutha County.—Owaka (H 342), 81·7.

Sounds County.—Waitaria Bay (H 65), 96·5.

Wallace County.—Colac Bay (H 633A), 50; (H 633B), 75.

Laboratory No.	Locality.	Insoluble Matter (Sand, &c.).	Alumina and Iron Oxides.	Calcium Carbonate ($CaCO_3$).	Magnesium Carbonate, &c.	Approximate Yield of Quicklime (CaO) in Calcined Limestone.	Remarks.
	Collingwood County.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	
G 519	Bainham	11·90	2·60	84·30	1·20	75	
G 520	,, ...	26·90	2·70	69·30	1·10	56	
G 521	,, ...	29·60	2·80	66·80	0·80	53	
G 522	,, ...	21·90	2·90	74·10	1·10	62	
G 752	,, ...	42·40	5·70	48·70	3·20	..	
	Waimea County.						
G 275A	Thorpe	0·58	0·64	98·70	0·08	..	Hard.
G 275B	,, ...	3·03	1·00	95·87	0·10	..	Medium.
G 250A	Sherry River ..	0·70	0·80	97·80	0·70	96	Hard.
G 250B	,, ...	11·90	2·20	83·40	2·50	74	Medium.
	Buller County.						
G 451	Arapito	44·40	4·30	49·40	1·90	..	Soft.

ANALYSES OF LIMESTONES.—SOUTH ISLAND—*continued.*

Laboratory No.	Locality.	Insoluble Matter (Sand, &c.).	Alumina and Iron Oxides.	Calcium Carbonate ($CaCO_3$).	Magnesium Carbonate, &c.	Approximate Yield of Quicklime (CaO) in Calcined Limestone.	Remarks.
		Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	
	Awatere County.						
G 626	Ward	15·20	1·30	82·80	0·70	73	
G 627	,, ...	27·60	1·70	68·90	1·80	55	
G 628	,, ...	5·30	1·60	92·50	0·60	87	
G 629	,, ...	8·10	2·00	89·00	0·90	82	
G 630	,, ...	6·50	1·40	91·00	0·50	86	
G 658	,, ...	27·10	3·80	67·70	1·40	..	Soft.
G 659	,, ...	25·60	3·70	69·60	1·10	..	,,
G 680	,, ...	28·50	3·93	61·97	2·71	..	Moisture 2·89.
G 681	,, ...	27·13	2·46	67·77	2·64	..	Soft.
G 683	,, ...	41·35	6·38	45·88	1·82	..	Moisture 4·63; soft.
G 684	,, ...	28·38	3·11	63·24	2·46	..	,, 2·81.
G 685	,, ...	18·77	1·98	76·42	1·08	..	,, 1·75; soft.
G 687	,, ...	19·32	1·67	77·95	1·06	..	Soft.
G 688	,, ...	20·37	2·37	73·68	1·48	..	Moisture, 2·10; soft.
G 774	Upper Awatere ..	16·80	3·10	77·30	0·90	..	,, 1·90; ,,
G 755	Ward	34·80	4·70	53·20	2·30	..	,, 5·00.
G 756	,, ...	32·70	4·30	56·50	2·10	..	,, 4·40.
G 757	,, ...	34·30	4·60	53·80	1·00	..	,, 6·30.
G 758	,, ...	36·60	5·10	50·70	2·60	..	,, 5·00.
G 759	,, ...	15·20	1·10	82·60	0·20	..	,, 0·90.
G 760	,, ...	38·90	5·30	48·90	2·40	..	,, 4·50.
G 761	,, ...	36·00	5·10	53·30	1·70	..	,, 3·90.
	Inangahua County.						
G 514	Rotokohu ..	2·40	1·00	95·90	0·70	93	
	Westland County.						
G 404	Koiterangi	9·40	2·40	87·50	0·50	80	
	Waipara County.						
G 408	Waikari	11·30	1·60	86·30	0·80	..	Soft.
G 464	,, ...	25·40	3·10	70·80	0·70	58	Hard.
	Ashley County.						
G 454	Rangiora	16·60	7·30	71·70	4·40	60	
G 463	Amberley	40·60	3·30	52·50	3·60	..	Very soft.
	Selwyn County.						
G 255	White Cliffs	30·30	1·90	67·30	0·50	51	
	Geraldine County						
G 244	Raincliff	24·96	5·34	67·84	3·86		
	Waimate County.						
G 543	Hakataramea	23·60	4·30	70·30	1·60	57	Calcareous sand.
	Lake County						
H 258	Pembroke	3·40	0·50	94·60	1·50	..	
	Southland County						
H 322	Invercargill ..	11·10	2·90	83·40	2·60		
H 323	.. ..	4·60	1·60	89·70	4·10	..	
	Wallace County						
G 439	Fairfax	5·80	1·30	92·40	0·50		

Mr. W. F. Pannett, of Scargill, confirms recently recorded experience regarding the durability of posts from good strains of blue-gum (*Eucalyptus globulus*). He states that about 1898 he put in two heavy gate-posts of blue-gum near Lincoln College, and found them in a very sound condition at ground-level when visiting the locality recently. The tree had been felled about two years before the posts were put in.

ORCHARD SPRAYS AND SPRAYING.

WITH HAWKE'S BAY POINTS.

By GORDON ESAM, Orchard Instructor, Hastings.

SPRAYS and spraying now play the most important part in an orchardist's business. In the general routine work there is nothing that requires such thoroughness and individual attention. With attention to pruning and cultivation reasonable fruit-bearing occurs in fair average seasons, but without careful spraying for the control of disease profitable crops will not be harvested. Only by thorough and judicious spraying with the right spray at the right time can the crop be saved in the best possible condition. The present high prices of spray materials may influence growers to stint the spray, but they should take warning. To spray well and thoroughly is economical spraying. Be sure to cover, and cover well, all infected parts.

PUMPS AND NOZZLES.

There can be no two opinions as to the efficiency of the power-pump over the hand-pump. Greater and more regular pressure can be maintained with the former. This advantage will not be elaborated here, but a few comparisons will be made of different nozzles. In my opinion, for best efficiency far too many nozzles of the "cyclone" type are in general use. The higher the pressure the finer or more misty the spray from these nozzles becomes. The result is that when a driving spray is required the effect (hence efficiency) is lost. On examination it will be found that a driving spray is more often required than a mist spray. Take the oil spray in the dormant season for red-mite eggs, mealy bug, and woolly aphis—there is no question that the more the spray is driven in the better the results are likely to be. The same remarks apply to summer spraying for these pests. A mist spray will often be as efficient as a driving spray for the control of codlin-moth, as in this instance only a coating is required on the surface; but with the calyx spray the mixture requires to be driven into the calyx. When sprays are used as preventives for fungus diseases, such as black-spot and leaf-curl, a mist spray will leave sufficient deposit, but when black-spot has made its appearance a driving spray is required to get the best results. In my opinion, the bordeaux type of nozzle stands out by itself for driving purposes, and in general efficiency is one of the best. The main argument used against these nozzles is that they are wasteful, but it is far better to apparently waste the spray and get the result than spare the material and not get the result.

APPLE-SPRAYING.

Dormant Season. — Apple-spraying will be dealt with first, commencing with the tree in its dormant condition. An examination might reveal one or more of the following pests present: San Jose

scale, red-mite eggs, mealy bug, mealy-bug eggs, and woolly aphis. Mussel scale has been practically eradicated in the commercial orchards of the Hawke's Bay District. At this season oil emulsion is the best known control. With San Jose scale the perfect insect lies in a semi-dormant state under the scale or shell covering. As the object of the oil is to kill the insect itself, the earlier the application is made the better. The other three pests mentioned will be found mainly in the egg stage, and destroying these is a much more difficult proposition than killing the perfect insect. When the trees show activity in the spring some of the eggs commence to hatch, and this indicates that the later the spray is delayed the more likely is one to get better results. It is only reasonable to assume that a lighter dressing of oil applied when growth commences will give the same results as one applied much earlier at a heavier strength. The custom in the past has been to use oil at 1 in 15 or thereabouts, with the application usually made not later than the first week in August. For the little good it does growers might save themselves the trouble and expense of applying it at this strength at this period. Oil at 1 in 10 applied in the dormant season would, in my opinion, give the result; and this would be economical and profitable spraying compared with the other, although costing more to apply. But if the oil at 1 in 15 had been applied four weeks later the results would no doubt have been much better. If growers cannot afford the greater strength of oil I would suggest the rate of 1 in 15 applied in September—the activity of the tree being the guide as to the time of application. Several growers claim that last season they applied it at this strength when the buds were opening—that is, before the clusters showed. Although it has not been tested and demonstrated, I am inclined to the opinion that oil at 1 in 15 applied at that period would give as good results as 1 in 10 applied four to six weeks earlier. Until we know more about the matter growers must be warned against spraying at a stronger strength than 1 in 15 or 1 in 20 at the later period.

To get the best results in the dormant and semi-dormant season use a bordeaux type of nozzle, and in directing the nozzle drive the spray in an upward direction, as red-mite eggs are usually found on the under-side of the spurs and limbs. All aphis-infected parts should be touched, and the spray driven under any rough bark, this being where mealy-bug eggs are most likely resting. If San Jose scale only is present, oil at 1 in 15 would do the work. The question will most likely be asked whether lime-sulphur could be used as a dormant spray for apples. With so many insect pests to fight, experience has shown that it is not nearly the equal of oil as a dormant spray.

Spring.—We now pass from the dormant to the cluster-bud development of the apple, and very important are the applications at this period. For the purpose of spraying, the development of the bloom can conveniently be divided into three stages—(*a*) opening spur or bud, (*b*) tight cluster-bud, (*c*) expanded cluster. The first stage describes itself; the tight cluster is that condition of development when flower-buds are tightly clustered together; the expanded cluster shows the flower-stalks distinctly separated and the buds fully pink, or perhaps white. No doubt the centre bloom in some of the clusters would be out. As the spur-buds develop and expand black-spot fungus becomes

active. This is the best and most important time in which to control it, and with varieties, such as Dougherty, which are subject to black-spot this spray should not be neglected. Bordeaux mixture at 6-4-50 is strongly recommended. Very excellent results were secured by several Hawke's Bay growers last season with bordeaux at 6-4-50, followed the same day, or soon after, with oil. The efficiency of this spray was clearly indicated, but we need to know more about the maximum strength of oil that is safe to use and how late it can be applied. Growers who purpose using this double application must be warned against spraying at a later stage than (*b*), the tight cluster. Oil at 1 in 25 to 1 in 30 applied on top of bordeaux at this period will do no harm. Do not use the oil if the trees have reached the expanding cluster, or reduce it to a strength of 1 in 60 to 1 in 80. On those varieties subject to mildew and not subject to black-spot it would be better and cheaper to apply atomic sulphur or lime-sulphur. Dilute lime-sulphur to 1 in 25 to 1 in 30. Atomic sulphur is used at the rate of 10 lb. to 12 lb. to 100 gallons of water. For mildew these sprays are very important and most desirable.

I would stress the importance of these sprays in the spring season. Most orchards are made up of several varieties which do not come into bloom at the same time. As the time of application is so essential to success, do not spray the whole of the orchard when the majority of the varieties have reached the right stage. If necessary, spray each variety separately, and better results will be obtained. Again, at this season a driving spray that takes the liquid right into the clusters will be much better than a mist spray.

Summer.—Passing from spring to the summer condition of the trees, the same insect pests (if not already killed) will be seen on trees, and, in addition, measures must now be taken to control codlin-moth and the leaf-roller. The two latter are chewing-insects and can be controlled by the same spray—arsenate of lead in either paste or powder form. For codlin-moth the calyx spray is most important. If possible, spray twice, first when half the petals of the bloom have fallen, and again when the remainder are off. The calyx closes so quickly that it is impossible to reach all with one spray. Again a driving spray is essential. An interval of four to five weeks could be left between the calyx-spraying and the next, but from then onwards it would be better to spray about every three weeks, or oftener, according to the weather conditions. An application in April is desirable, particularly for leaf-roller. Direct the spray at the fruit and cover it thoroughly—this is the secret of success.

For summer control of red mite any summer insecticide will do the work, lime-sulphur being possibly the cheapest. If the dormant spray was not successful this pest must be fought in the summer. The time of application is very important, and the first spray should be given when the first mites are on the move. Repeat twice at intervals of seven to ten days, the object being to kill all the mites before they commence laying their summer eggs. No spray can be put on strong enough in the summer to kill these eggs, hence the importance of killing the insect before egg-laying is commenced. The mites usually start to lay what are known as "winter" eggs in January, and two or three sprayings at short intervals at this season will greatly minimize

infection the succeeding year. Use a driving spray, directing it at the under-sides of the leaves, this being where the greatest number of insects are found.

Woolly aphis is a more formidable foe in the summer-time. Black-leaf-40 or nicotine sulphate is the safest and perhaps the best preparation to use, but this could be improved on. The resin-soda compound is equally effective, but cannot be used before February or thereabouts, as earlier than this it is liable to scorch. It may be necessary to spray for aphis in December. Use a bordeaux nozzle fairly wide open; the woolly covering of the pest must be removed and the spray driven well into the base of the wounds. Unless this is done no summer spraying will be effective. A second application will be necessary in January or February.

A close watch must be kept for the appearance of fungus diseases in the summer. Provided the cluster-bud application has been honestly done, there should be little trouble with black-spot except on Dougherty, Stone Pippin, Rome Beauty, and possibly Delicious and one or two other varieties noted for their susceptibility. The danger of summer spraying, particularly with bordeaux, is the russeting of the fruit. The varieties mentioned are fairly tough in the skin, and bordeaux at 3-4-50 should do little or no harm in this way. On these varieties it would certainly be advisable to give one bordeaux spray as soon as the fruit is set. On all other varieties use lime-sulphur at 1 in 100; but if the disease makes its appearance rely on bordeaux, which has more fungicidal properties. Repeat the application every two or three weeks, according to the weather; the wetter the season the more frequently the spray is required. It would possibly be safe to leave a greater interval from the second week in January onwards. Atomic sulphur will not control black-spot in the Hawke's Bay District. Lime-sulphur and atomic sulphur are more effective against mildew than is bordeaux. If mildew is present or troublesome a spray once a month will suffice, but do not omit the early cluster spray, otherwise more frequent application will be necessary.

Combination Sprays. — While dealing with apple-spraying a few remarks on the combination sprays may be useful. I refer principally to the combined lime-sulphur-arsenate-of-lead spray. This is a popular spray on account of the dual purpose which it serves. Unfortunately, during the past two seasons it has been responsible for some rather serious scorching. If this cannot be overcome the combination must be dropped and each applied separately. An endeavour will be made to discover some of the possible causes of this scorching. Lime-sulphur at 1 in 100 is a safe and efficient spray when applied by itself, and the same can be said of arsenate of lead when applied in the usual proportions. When these two are combined there is a chemical change, which is very evident by the decided change of colour. It is a change that increases the insecticidal properties of lime-sulphur and does not reduce the properties of arsenate of lead. Regarding the effect of the combination on the fungicidal properties of lime-sulphur, personally I think these properties are not altered. If anything, the combination causes a more caustic mixture, and to overcome this the lime-sulphur must be reduced to at least 1 in 120 or 130, or even weaker.

As to mixing, I think the best way to do this is to adopt the same method as followed when preparing bordeaux mixture, which, briefly, is to pour at the same time the diluted bluestone and diluted lime into a third vessel. In the same way, dilute both the lime-sulphur and arsenate of lead, and it will be a better mixture. If appliances are not available for diluting heavily, I see no reason why the same result could not be obtained by diluting each ingredient to, say, 5 gallons, and pouring together into a third vessel or spray-tank, and afterwards adding the required quantity of water. Good agitation is required with this mixture. Be very careful to run off the sediment after each barrel or tank is used. If this is not done it mixes with the next lot—no doubt detrimentally. The draining-off of the sediment is most important when this combination mixture is used. In my opinion, this is where a good deal of the trouble in question lies. Following these directions one should have little or no trouble with scorching if the lime-sulphur has been diluted to 1 in 125, or weaker. If trouble occurs I would recommend adding lime to the arsenate of lead, making a diluted solution of each and pouring into a third vessel. Use a little more lime by weight than arsenate of lead. So far, no scorching has come under my notice from the combination of arsenate of lead with either atomic sulphur or nicotine sulphate.

Nothing will be said here at length concerning the merits of atomic sulphur as compared with lime-sulphur. In Hawke's Bay atomic sulphur has not shown fungicidal properties equal to those of lime-sulphur, but it is quite the equal and perhaps better as a controller of mildew, and as a rule leaves the foliage brighter. I see no reason why all growers should not prepare their own lime-sulphur solution. All that is required is a Beaume or other hydrometer to test the specific gravity; once this is known the proper dilution can be made.

PEAR-SPRAYING.

With the exception of woolly aphis the same insect pests will be found attacking the pear. San Jose scale will be equally bad as on the apple. Red mite will not be so troublesome, but in Hawke's Bay I have known it to have a good hold. The spraying for these two pests will be the same as for the apple. Mealy bug has a much greater hold on pears, and will become most serious if not checked. The rough bark offers exceptionally good cover for the bug and its eggs. If the pest is bad and time will permit, it will pay to scrape off the roughest of the bark. When spraying, the oil must be driven well into these coverings. Collect and burn all rubbish, as this offers good shelter for the bug. Red-mite eggs are slightly easier to kill on pears than on apples. Oil at 1 in 12 will do work equal to oil at 1 in 10 on apples. The same remarks do not apply to San Jose scale.

The cluster-bud spraying of pears with bordeaux is most important, and on Nelis, Josephine, P. Barry, and some other varieties it is indispensable. Many growers will recollect the shrivelling-up of the blossoms, which in bad cases make the trees appear as though scorched by fire. What this disease or trouble is I have been unable to discover. My investigations showed that it is readily controlled by bordeaux at 8-6-40 when applied in cluster-bud. For this particular trouble I think the tight-cluster spray will give the best results.

Pears as a whole are more subject to black-spot than apples, but the treatment is similar. Following the bordeaux cluster-bud spray, pears should have bordeaux at 3-4-50 when the fruit has set. In moist and muggy seasons bordeaux should be continued. Lime-sulphur at 1 in 80 would be sufficient preventive in an average dry season. I would again impress the importance of the cluster-bud spray both for the blossom-shrivelling trouble and black-spot. Lime-sulphur at 1 in 20 could be used at this stage, but it must be understood that it is not the equal of bordeaux. It is highly essential that pears should be sprayed for black-spot up to within a week of packing. This will overcome and prevent serious development of the disease in transit and possible condemnation at destination. This is a point that is usually overlooked by growers, very few of whom realize that the fungus develops after it leaves the orchard or packing-shed. To avoid this uncertainty spray the fruit just before picking.

The calyx on pears does not close so quickly as on apples; in fact, some do not close at all, and one spraying for codlin-moth with arsenate of lead would do at this season. Spray when the fruit has well set, and repeat as for apples. Williams and Louise Bonne pears should be sprayed to within a few days of picking, as these varieties are very susceptible to moth-infection at the time they ripen.

If spraying for codlin-moth has been well carried out there will be little or no trouble from leech. Unfortunately, it is the custom to neglect codlin-moth spraying when the crop is light, with the result that leech spreads rapidly, to the detirment of the tree and foliage. It is most important that leech should be controlled, otherwise the leaves will not carry out their normal functions, and the development of the buds and spurs will be retarded.

SPRAYING OF STONE-FRUITS.

Peaches and Nectarines.—San Jose scale and red mite will be the chief insect pests found on these fruit-trees. For San Jose scale the trees should be sprayed early in winter with oil at 1 in 17 or lime-sulphur at 1 in 14 or 15. About the third week in July is a good time to spray for red mite, using oil at 1 in 14 or 15. I am not satisfied that lime-sulphur at 1 in 10 will kill red-mite eggs on these stone-fruits. Both these pests will be found in greatest numbers on the main branches and limbs. These parts should be well sprayed, while at the same time the smaller limbs and twigs must not be missed. Red-mite eggs are easier to kill on peaches and nectarines than on either pears or apples. Provided the insect pests are kept well under control I think it is advisable to alternate oil and lime-sulphur in the winter, oil being the better insecticide. This latter fact must not be overlooked.

Spraying for fungus diseases is most important in the spring, and it would be disastrous to neglect this work. The best time to spray is when the buds show pink. Use bordeaux at 8-6-40 for leaf-curl and, incidentally, brown-rot, shot-hole fungus, and rust. Lime-sulphur at 1 in 15 can be used, but it is not the equal of bordeaux. Most of these fungus diseases start activity at the same time as the trees commence growth, hence the great importance of the spray at this period.

Most stone-fruit orchards are made up of a number of varieties, the late varieties usually coming into bloom first. Spray each variety when the majority of the buds show pink. Do not make one spraying do for all varieties—it is folly to do so. When applied in the pink the result is very much better than when the trees are dormant.

Until something more is known about brown-rot a definite line of control by spraying cannot be indicated. Owing to the tender state of the foliage bordeaux cannot be used in summer. Lime-sulphur at 1 in 125 is apparently safe. Experiments are being carried out in the Hawke's Bay District, the results of which will be made known in due course.

Apricots.—Insect pests are not usually troublesome on this fruit in Hawke's Bay, but should they be so, treat as for peaches. The pink spray with bordeaux should not be neglected, this being important in the control of shot-hole fungus, rust, and brown-rot.

Plums.—The spraying of plums has not been given the attention it requires. San Jose scale and red mite are quite as prevalent as on peaches. Plums will stand a stronger oiling than peaches; it should be used at 1 in 14. Apply when dormant, but delay it as late as possible for mite. Plum-rust is particularly bad on most English varieties, sometimes defoliating the trees by February. The cluster-bud application of bordeaux at 6-4-50 is most important in the control of this disease, but is nearly always neglected. One or two subsequent sprayings of bordeaux at 3-4-50, or lime-sulphur at 1 in 100, are also necessary at intervals of about a month. Do not neglect rust-control. I am of the opinion that rust is responsible for many light crops; the trees cannot carry out their normal functions when defoliated so early. More attention should also be given to leech. Arsenate of lead is the best spray that can be used for controlling this pest, but I think hellebore powder should be used while the fruit is on the trees, particularly towards the ripening stages. The effects of this poison go off much more quickly than those of arsenate of lead.

CONCLUSION.

In conclusion, I would emphasize that too much unnecessary risk is taken in fruitgrowing, particularly in regard to sprays and spraying. The successful orchardist is the man who prepares for the worst possible weather conditions, selects the best and most profitable spray for the purpose required—even if it is dearest—and, when spraying, does not stint the spray.

The swede crop at Ruakura this winter has a good deal of high paspalum growing through it. From a feeding point of view this is considered rather an advantage than otherwise.

Several dray-loads of good, sound, selected mangold and swede bulbs have been planted for seed-production at Ruakura. The varieties selected are Jersey Queen and Long Red mangold, and Superlative swede.

WORK FOR THE COMING MONTH.

THE ORCHARD.

It is well recognized that the carrying-out of fruit-tree spraying and other orchard-work largely depends on special conditions. General information may be given on the subject, but such advice must be varied more or less to meet the conditions applying. How and when such variations should apply must be largely left to the judgment of the operator. Local conditions have also to be taken into account, and a readjustment made accordingly.

Although it is impossible to forecast the weather or to give definite advice to meet unknown conditions, it has been considered possible to make available something more definite with regard to local conditions in these monthly notes of advice and reminder for orchard-work. With this in view the Orchard Instructors of Auckland, Hawke's Bay, Nelson, Canterbury, and Otago will, for a time at least, contribute brief notes on the work of the coming month in connection with their respective districts.

Special notes for Otago, unfortunately, do not appear in this issue owing to the Instructor of that district having just gone into military camp and his successor not having yet been appointed.

September is a most important month for the orchardist. With the dormant season over and the advent of warmer weather a large amount of work of the greatest consequence requires attention. This includes the finishing-up of any unfinished planting or pruning, the general clearing-up of prunings and rubbish, late winter and early spring sprayings, application of manures, ploughing and digging, and grafting.*

—J. A. Campbell, Assistant Director of the Horticulture Division.

AUCKLAND.

Orchardists are reminded that the first week or two of September affords their last opportunity for carrying out initial season's sprayings, as nearly all our varieties of peaches, plums, apricots, and pears, and several varieties of apples, burst their blossom-buds during this month. One spraying, using the correct formula, at this time is worth half a dozen put on at weaker strength later.

It is imperative, therefore, that those growers who have not yet completed their pruning operations should do so at the earliest opportunity. When clearing up in the orchard preparatory to commencing cultivation, orchardists (and especially stone-fruit growers) are advised, on account of the prevalence of brown-rot and other fungus diseases in the Auckland District, to destroy all prunings and rubbish by burning.

Manuring: Owing to existing war conditions, prices for orchard manures generally have increased considerably since last spring. Nevertheless, every orchardist is aware to what extent soil-depletion takes place annually throughout his orchard, and this must be replaced if production is to be maintained. Manures should be turned under the surface as soon as possible after application in early spring.

* For details of grafting methods see special article in *Journal* for September, 1916.

Cultivation: Every effort should be made to complete ploughing before the end of the month. The heavy growth of *Lotus angustissimus* in early spring in the Auckland District, together with the probability of the surface soil becoming too hard should dry weather set in early, necessitates the early completion of this work when labour allows.

Brown-rot: A further series of experiments for the control of brown-rot of stone-fruits is being carried out this season on four orchard blocks at Henderson, the local fruitgrowers' association co-operating with the Department for this purpose. Self-boiled lime-sulphur will be tested on these plots this season. Any orchardist requiring information regarding this preparation is advised to communicate with the local Orchard Instructor.

Spraying: Orchardists troubled with scale and other sucking-insects should have done their oil-spraying by the end of August, and are warned to exercise great care if applying the same now.

Spraying is recommended for the month as follows:—

Peach, nectarine, and plum: Colour bud (when blossom-buds show pink)—bordeaux, 8-6-40; when three-fourths bloom-petals dropped, and again when fruit has set—bordeaux, 2-3-50, or lime-sulphur, 1–120.

Pear, apple, and quince: When buds are swelling—bordeaux, 8-6-40; cluster-bud (when blooms are showing colour)—bordeaux, 6-4-50.

Lemon and orange: Before young October growth commences—bordeaux, 5-4-40. —*J. W. Collard, Orchard Instructor, Auckland.*

HAWKE'S BAY.

Peaches: During the last half of July the weather was extremely cold, and if it continues so stone-fruit trees will bloom much later than usual. It is possible that at the time these notes appear it will not be too late to spray for leaf-curl and incidentally brown-rot and other fungus diseases. Bordeaux is the best fungus preventive, 8-6-40 being the weakest strength that it is advisable to use. If San Jose scale is present, and oil has not been used, it would be better to use lime-sulphur, 1–15. This spray will not control curl as well as bordeaux.

Plums: Spraying of these fruits is much neglected in Hawke's Bay, particularly in regard to English varieties. The latter are often defoliated by plum-rust by the end of January. Preventive measures should be taken at the time of bud-movement in the spring. The cluster-bud period is the best time to commence spraying, using bordeaux, 6-4-50, at this stage. This will also act as a control against brown-rot and shot-hole fungus.

Cultivation of stone-fruits: Ploughing of this section of the orchard should be completed as early as possible, the idea being to bury the small prunings, &c., that have been missed in gathering. Many of these carry disease, particularly brown-rot fungus, and should be covered by the time the trees show activity in the spring.

Apples: The dormant season offers special advantages for fighting San Jose scale, red mite, and mealy bug. At the present time red-oil emulsion is the best remedy. It is essential in good orchard-management that all apples should be sprayed with this material at a strength that will do the desired work. Red mite will be the most prevalent of the diseases mentioned and the hardest to kill in the winter-egg stage. Apply oil at a strength not weaker than 1–10 to prevent the eggs hatching. If the trees show signs of bud-movement the oil must be reduced to 1–15. The former strength might do injury at this stage. Endeavour to spray sufficiently early to use the stronger strength. As soon as the trees commence to develop their fruit-buds into blossoms direct action must be taken against fungus diseases, of which black-spot and mildew are the most prevalent. Trees subject to black-spot, such as Dougherty, should be sprayed with bordeaux, 6-4-50, when they reach the cluster-bud stage. This application is most important, and should not be neglected if successful control of this disease is expected. Varieties such as Jonathan, which are subject to mildew and not troubled to any extent with black-spot, would be better sprayed at this stage with lime-sulphur, 1–25, or atomic sulphur, 10 lb. to 12 lb. to 100 gallons. Do not omit these sprays; they are most essential.

Pears: These fruits are subject to the same insect pests as the apple and should have a similar oil-dressing. A weaker strength may be used—say, 1–12 where 1–10 is used on apples. The cluster-bud spraying of pears is most important, and on Nelis, Josephine, P. Barry, and some other varieties is indispensable. Many growers will recollect the shrivelling-up of the blossoms, which

in bad cases made the trees appear as though scorched by fire. My investigations showed that this is readily controlled by bordeaux, 8-6-40, when applied in cluster-bud. For this particular trouble I think a spray at tight-cluster will give the best results. Pears as a whole are more subject than apples to black-spot, but the treatment is similar. Do not miss the cluster-bud bordeaux spray.

—*G. Esam, Orchard Instructor, Hastings.*

NELSON.

Spraying: During September some of the more important spray applications have to be made, and the importance of the time of application cannot be stressed too much. It is necessary to cover the trees with a protective fungicide before the first flight of winter spores emerge. Experience in this district indicates on apple and pear trees that early September, before the buds start, is usually the best time for applying the first fungus-spray, more particularly for black-spot fungus. For this purpose lime-sulphur, 32°, 1-10, is suitable in most cases, but where black-spot fungus has been troublesome in the past, bordeaux, 8-6-40, should be used.

Cultivation: The orchard cover-crop will mature during the month and require turning in. This is an important operation, as a great deal of the value of the cover-crop depends on the work being done well. A chain is of great assistance in thoroughly ploughing in the crop; one end should be attached to the head of the plough and the other to the beam, in such a way that a loop drags by the mouldboard and holds the crop while the furrow is being turned. A special attachment for the plough can be purchased which does this work very well. The amount of injury done to the lower branches of orchard-trees by the plough, and the constantly repeated statement of the need to cut away the lower branches of lateral-bearing trees because of the difficulty of ploughing, requires consideration. A special orchard-plough should be used for the first few turns round the trees, and it should be properly set with the handles to one side. The quietest horse in the team should be chosen for this work, and he should be harnessed with leather traces and "spider" harness to support them; a very short spreader is necessary, and to do away with the damaging hooks it is all the better if the traces come round the ends of the swingletree before being fastened. After these few rounds a light double-furrow plough can be used to advantage. Considerable damage is done by deep ploughing in the orchard; the finer feeding-roots are not much below 5 in. from the surface in a well-conditioned orchard, and to cut them away is a big loss.

Manuring: Where large crops are being harvested it is reasonable to manure the trees, especially stone-fruits. Chemical manures generally are best applied at the time of the spring ploughing. As the roots of bearing trees fully cover the 18 ft. or 20 ft. of space between the orchard rows, manures may be applied over the whole surface, with a drill or special broadcasting-machine. Heavy-cropping sorts, like Rokewood, Sturmer, and Jonathan, and most stone-fruit, will require special consideration.

Grafting: Most orchards require some attention in this respect. One of the most important factors for success is performing the operation at the right time —namely, after the trees have started into growth. This is usually about the end of September here. Stocks should be prepared by heading them down some few weeks beforehand.

—*W. C. Hyde, Orchard Instructor, Nelson.*

CANTERBURY.

Oil-spraying for the control of sucking-insects, such as woolly aphis, mussel scale, San Jose scale, red mite, mealy bug, &c., that has not been attended to in August may be continued up till about the middle of September.

Pruning and planting, which, owing to the bad weather experienced, will be all behind, may be continued, but should be pushed on with as much rapidity as possible. Towards the latter end of the month will be the most suitable time for reworking any unsuitable varieties of apples and pears. There are various methods of grafting, but rind-grafting will give a good result, and is much quicker than any other method. Trees to be reworked should be at once roughly cut back—say, to within 4 ft. of the ground—and then cut back again to the desired height for working when the operation is to be performed. The scions for grafting, if not already taken off, should be at once cut and heeled in, either in sand or soil that is not overwet, in a shady situation.

The critical period is now at hand for the control of fungoid diseases for the season. Stone-fruit trees usually commence blooming in Canterbury about the middle of the month, and it is therefore necessary to carefully watch the several varieties coming to what is called the "pink" stage. This is just before the blooms open, when bordeaux should be applied. A second spray of lime-sulphur should be applied when the blossoms have nearly all fallen. Spring spraying of bordeaux for the control of black-spot of apple and pear should be applied when the cluster-buds appear and are showing colour, followed by a summer formula when the fruit has set. Pears and apples do not usually come to bloom in this district until the last week of September.

Thorough cultivation is necessary at this time of the year to prevent the loss of soil-moisture. If the orchard has been ploughed in autumn I would not advise cross-ploughing, but simply disking or cultivating the surface. If no ploughing has taken place I would recommend ploughing at once, so that all growth and rubbish can be turned in before the trees commence to bloom, followed with light cultivation. —*W. J. Courtier, Orchard Instructor, Christchurch.*

POULTRY-KEEPING.

By F. C. BROWN, Chief Poultry Instructor.

ARTIFICAL BROODING.

THERE is probably no branch of the poultryman's work which demands the same care and attention to details as that of rearing the artificially hatched chick. Hatching chicks by means of an incubator is a simple matter in comparison to rearing them with an artificial brooder. Providing the incubator is of a reliable make and is properly managed it can be trusted to do its work thoroughly, even when left unattended for many hours at a time, but with young chicks in a brooder the case is entirely different, for unless they are frequently and carefully attended to satisfactory results cannot be obtained. The man who is successful in brooding chicks leaves nothing to chance. He keeps a close watch on the little birds, and at the first sign of anything wrong he looks for the cause and removes it. He also takes climatic influences into account, and sees that the right degree of heat is always maintained under the hover as well as an ample supply of fresh air.

The chief cause of brooder mortality lies in allowing the chicks to become chilled. Thousands of chickens die annually from no other cause. There are many ways in which chicks become chilled, but usually it is the result of sudden changes of temperature, such as overheating or underheating in the brooder, or giving the chicks too much liberty during the first few days. Once a chicken becomes chilled bowel trouble usually follows in about three days, and this is fatal at any time. There are other signs indicating chill, such as huddling in corners, droopy wings, spread legs, a distressed chirp, an excessive thirst, and no inclination to leave the brooder or to eat. When chicks become badly affected in this way nothing can be done for them, and usually the best thing to do is to destroy them, as even if they do recover they seldom prove profitable stock to keep. The only bird that will really pay to rear is one that goes right through to maturity without a check.

In artificial rearing some losses are inevitable, but the greatest source of loss can be easily avoided by taking the methods of the mother hen as a set of instructions. The fact must be remembered that the brooder is merely a makeshift for the natural process, and if success is to be assured the method of the hen must be copied as closely as possible. The first essential is to see that a uniform temperature is provided under the hover, while at the same time provision must be made for the admittance of fresh air. Half the chicken troubles can be traced to failure to observe these two golden rules. One has only to study the hen and her brood to prove this. There it will be seen that while the chicks are kept warm and snug they are given an opportunity of breathing fresh air, which is so essential to their welfare. Indeed, in these days of advanced study in the rearing of brooder chicks it is recognized that one of the most important principles evolved is the necessity of fresh air in the brooder-box. Whether it be with the heated or the fireless brooder, neglect to provide the necessary fresh air for the chicks is a common reason for the failures recorded. True, a correct and uniform temperature is imperative, but it must be a healthy heat, a heat which, while providing the desired warmth, does not force the delicate chick to breathe vitiated atmosphere. While fresh air is a very necessary provision, it must be supplied without draught. A draught is one of the most fatal things to young chicks, and must be guarded against at all costs.

Placing baby chicks in a poorly ventilated brooder is bad enough, but where the brooder is not kept in a sanitary state failure is inevitable. The importance of cleanliness in the management of brooder chicks cannot be overestimated. Dirt means disease, infection, and the presence of vermin, and once these make their appearance the mortality is sure to be high. The brooder should be kept sweet and clean by frequently renewing the bedding and litter material. When a new hatch of chicks is moved to the brooder the latter should be thoroughly cleaned and disinfected. A weak solution of sheep-dip or other suitable disinfectant applied with a whitewash-brush will serve the purpose. Successful brooding demands constant observation and attention. Even during the day there is always a danger of leaving the chicks too long by themselves. Especially is this the case where the fireless brooder is employed, as, having no artificial heat to induce them to go under the hover, the chicks are apt to huddle in the run and become chilled. On no account overcrowd the brooder. It is one of the things that never fails to give trouble. It is always a safer policy to have too few chicks in a brooder than too many.

Chicks should not be moved from the incubator to the brooder for at least twenty-four hours after they are hatched—shifting them before they are thoroughly dried off is a common cause of chill. After they are placed in the brooder there is no hurry to feed them; they will not die of starvation; nature provides all the food they require for at least the first two days. During the first few days a comfortable degree of warmth in which the chicks can sleep in quietness is of more importance than food. The floor of the brooder should be well bedded down with straw, chaff, cavings, or pine-needles. When chicks are comfortable and have the right degree of heat they will spread out over the floor of the brooder. On the other hand, if they are cold or suffering from the effects of chill they will huddle together. The great

danger of chill is during the first week. Up to this stage special care should be taken not to give the chicks too much run. They should be confined in the brooder for the first three days, and then given only a short space to exercise in until they get well accustomed to their new surroundings.

THE FEEDING OF CHICKS.

There are two systems generally practised of feeding chicks—a moist mash and a dry mixture. Both systems have their advantages, and there are many different mixtures for each that will give equal results; but whichever system is adopted only the best grains should be used. For the first few days young chicks should be fed every two hours. All food should be fed on flat trays with low sides, and the trays should be removed as soon as the chicks appear to be satisfied. It is essential that the chicks be given ample exercise. The best way to encourage this is by throwing some broken grains into the litter, which induces the chicks to scratch for it. Sometimes even healthy chicks go off their food, but this is not necessarily a sign that they are being overfed. It more often means that they are tired of the one particular class of food provided, or of the manner in which it is supplied. In this case a good plan is to supply the food in a different form, such as moistening with milk at one time, with soup at another, and at times steaming. Chicks will usually thrive better when the dry broken grains are slightly moistened some time before using. This causes them to swell, and prevents them doing so in the bird's crop. Fresh clean water should be available to the chicks at all times, and the vessels containing it frequently cleaned. Chicks should be given an ample supply of young, tender green food, such as finely cut grass, lettuce, &c. Few people realize the value of watercress as a green food. Where this material is available it may be fed in large quantities to chickens of all ages.

The chief essentials in successful chick-production are healthy breeding-stock, uniform temperature in the brooder-box, a proper system of ventilation, feeding only sound grains, and strict attention to cleanliness.

THE APIARY.

By E. A. EARP, Apiary Instructor.

SPRING WORK.

By this time the first examination of the hives should have taken place. As stated last month, the question of stores is of first importance, and every effort should be made to provide the bees with ample food to carry them on until nectar is available. Owing to the exceptional severity of the winter, particularly in the South Island, it may be found in many cases that the bees have not consumed as much honey as usual. The weather conditions will probably also have influenced brood-rearing to a large extent, and although brood may normally be found in the hives by the end of July, this year abnormal

conditions have prevailed, and it will be unwise to judge a colony queenless because there is no brood showing at a first examination. With the advent of warmer weather the colonies will soon build up to their usual strength.

When colonies are weak, or show other signs of a poor queen, it is best to kill the queen and unite the colony with a stronger one. It is useless to try to carry a poor colony on to the summer. By the time new queens are available it will have nearly dwindled out of existence if it has not been robbed out, and even if it lives until it can be requeened it will hardly build up sufficiently to give a surplus in the coming season. Only strong colonies should be tolerated in an apiary, and it is much the better plan to dispose of all the weak stocks and prepare the hives thus vacated for increase later on. A simple method of uniting is to place the weak colony over the strong one with a single sheet of newspaper between the two hive-bodies. The bees will gnaw the paper through and unite quite peacefully in a day or two.

PRECAUTIONS AGAINST ROBBING.

All work which necessitates opening the hives should be carried out as expeditiously as possible, and no hives left open longer than can be helped. No combs should be exposed to the bees at this time of the year. It is a good plan to carry an empty super round on a barrow, in which the end combs can be placed and covered while the work of examining the colony is going on. It is necessary to remove one comb at least so that the rest may be easily handled, but this comb, however dry, is as well kept out of the way of would-be robbers. Spring robbing, once started, may become as disastrous as autumn robbing, and must on no account be encouraged. All feeding should be carried out just before dusk, and if any syrup is spilled it should be at once covered up or removed out of harm's way.

STARTING AN APIARY.

The beginner who is desirous of starting an apiary may commence at any time now. For the next month or two he will only be able to obtain established colonies, as swarming is still several months ahead. If he decides to commence at once, and thus obtain the full benefit of the season's experience, he should get into communication with a reliable breeder and obtain nothing but absolutely guaranteed stocks. On no account must the tyro be led away by the apparent cheapness of bees offered for sale. If he should contemplate purchasing any other than those of any apiarist who makes the sale of bees his business, he should have his prospective purchase examined by some person of experience, and be quite certain of the cleanliness of the colonies before taking possession. The sale of discarded bees is forbidden by law, but apart from that they are a dear bargain, as they will cost much in money and time to bring them to a healthy condition, and, moreover, yield nothing during the first season. A good hive purchased now, placed in a sheltered position, and carefully watched to see that its stores are sufficient to last it till nectar is abundant, will probably (if the apiarist desires it) yield a good swarm, and both parent hive and swarm should give a surplus when the main honey-flow arrives.

HINTS TO BEGINNERS.

There are a few points which every beekeeper should bear in mind when starting an apiary. The stocks must be clean and in good condition. No beekeeper can hope to succeed with poor bees, and no one but a novice would tolerate anything but strong colonies. The hives should be well made and painted; cracks and knot-holes may be of use for ventilation in the summer, but at any other time of the year they absorb a lot of the bees' time in gathering propolis to stop the draughts; moreover, any holes besides the entrance offer an inducement for robbers to investigate, and necessitate the bees employing extra guards to prevent attack. A careful watch should be kept on the stores in order that the bees do not starve. It is far better to overfeed than underfeed, because it is amazing how quickly a colony will deplete its stores when brood-rearing commences in the spring. More feeding means more brood, but once commenced it must be continued until the hives show actual proof that they are gathering sufficient nectar to keep themselves going. Feed only in the evening, inside the hives, and use a syrup in the proportion of 2 parts water to 1 part sugar; dissolve thoroughly, and feed as soon as it has cooled sufficiently to be harmless to the bees.

Provide permanent shelter. A live hedge is the best if kept trimmed to a height of about 8 ft. or 10 ft. Failing this, some kind of a break-wind is essential. The hives should never be exposed to high winds, as, in addition to the danger of the roofs being removed, cold draughts check brood-rearing to an enormous extent.

Only open the hives on warm still days. Make your observations as quickly as possible, and make a note of them at once. The inside of the cover makes a good rough diary and does not get lost or mislaid. Mark the date of each examination. Endeavour to distinguish the sex of the brood at a glance, and keep a sharp lookout for the queen; she is easily distinguished by the length of her body and the comparative shortness of her wings. Try to make a rough estimate of the weight of each frame as you lift it, comparing it in your mind with an empty comb, thereby arriving at some idea of the quantity of stores in each hive. Do not try to run many hives until you have grasped the rudiments of the business, but content yourself with one or two strong colonies until you have passed the learner's stage.

VITICULTURE.

By S. F. ANDERSON, Vine and Wine Instructor.

THE VINEHOUSE.

WHERE the vinehouse has been closed at the beginning of July strong growth will be pushing out from the buds the vines were pruned back to. In the case of a new rod entering upon its first year of bearing there will be but one strong bud at each joint. Only one shoot is produced from these. The growth, however, from these young rods will most likely be long-jointed—that is, the distance from one leaf

to another is greater perhaps than where a number of shoots are put forth as from an older rod.

In training the shoot from the young rod it is allowed to push forth till it has made some 2 ft. of growth, by which time the young fruit stands out quite distinctly and a number of leaves have opened out beyond the fruit. If it is four to six, leave two beyond the fruit, pinching off with the finger and thumb the leaves beyond that place. This is the first stopping. The growth being young and tender at this stage it does not give that check that must occur when done at a later stage. After this the further growth made at the place where the vine was stopped is allowed to go on till another five or six leaves are grown, when a second pinching with the finger and thumb is made, leaving another two leaves and making four leaves beyond the fruit. This stopping requires to be repeated several times, always leaving two more leaves. It will then be seen that the joints have become shorter and stronger, the leaves closer together, and their surface increased yet kept within reasonable limits. Another effect will be the starting-out of small subshoots or laterals from the base of some of the leaves. These should not be broken out, but their tips pinched, leaving one or two leaves. By the time the fruit is fully developed there should be from twelve to twenty leaves to nourish and mature a good bunch of grapes.

In the case of older rods, although they may have been pruned to one strong bud there are other dormant buds that put forth shoots. The strong bud selected at the time of pruning puts forth the best shoot generally, but it is safer to let all grow sufficiently so that a selection may be made. This can be done when all have grown 4 in. or 5 in. The best one is then retained.

A good lookout must be kept for mildew. In those houses where it has appeared before it is better, however, to give the vines a spraying of sulphur in any case. The following method is recommended: Throw a handful of sulphur into a kerosene-tin, and mix it with a little milk (not sour), just sufficient to make a stiff paste, care being taken to remove all lumps. Then fill the tin with tepid water, taking care that it is not too warm, as, if so, it would have the effect of curdling the milk. Spray this in the usual way, taking care to wet every part of the vine and foliage.

THE VINEYARD.

The vines will now require disbudding, which consists in the removing of all unnecessary shoots, such as those not bearing fruit and not required for wood. With the method of training practised in New Zealand—the double Guyot—the Pineaux varieties all require careful attention in this matter. The vine has been pruned and the two arms tied down to the wires. As these arms are rods of last year's growth no disbudding is required on them, and the operation is confined almost entirely to the stem. If the pruning has been done properly there should be four or five spurs in the crown of the stem. The growths from these are to provide four stems for the coming year, the fifth being one in reserve. If the four all grow the fifth can be rubbed off. Any other growth made, whether from adventitious buds or suckers from below the ground, should be taken clean out. The American varieties, such as Albany Surprise and Isabella, do not require disbudding, but any suckers from below the stem should be removed.

CELLAR-WORK.

The work in the cellar will be much the same as that given for last month —at least, during the cooler days of the month. With the gradual rise in temperature, wines, especially new wines, will begin to show signs of movement or fermentation. If the wine has been well made this need not give cause for anxiety. Ease off the plugs or bungs and allow the fermentation to work out, carefully watching each cask as this proceeds. It is to be understood, however, that the second racking should have taken place some time before the appearance of this movement. No transport or shipping of the wine should be attempted during this stage of its condition. The fermentation can be checked by racking it off into a freshly sulphured cask, but as a rule it is best to avoid such a practice and let it work out in a quiet way.

THE GARDEN.

By W. H. TAYLOR, Horticulturist.

VEGETABLE-CULTURE.

VEGETABLE-SEEDS to sow in September are turnip, red beet, carrot, parsnip, leek, peas, cabbage, cauliflower, brussels sprouts, parsley, lettuce, radish, broccoli, capsicum, chili, celeriac, red cabbage, and tomato.

Plants of the following may be put out: Cabbage, cauliflower, lettuce, Jerusalem artichoke, rhubarb, herbs, and celery.

Turnips should be sown in small quantity, as they soon become woody after reaching maturity. It is necessary to sow frequently through the summer months, at intervals of seven or eight weeks. Red beet of a round variety is best for early use, coming into use quicker than the long varieties. Carrots need not be sown if a sowing has been already made. Parsnips may be sown if wanted early. A round variety would answer best. It is not advisable to sow yet unless there is plenty of room, otherwise it would be best to sow a month or two later for winter use and employ the spare space in growing a summer vegetable.

Leeks should be sown in quantity sufficient for the main supply. Peas in usual course are sown every two weeks. Brussels sprouts are the best of all winter vegetables; sow at once, as they require a long season of growth. Sow a broccoli of early type; Adams Early is a good sort. Capsicums and chillies are suitable only for the warmer parts. Sow under glass, prick out in boxes when ready, and grow to good plants before hardening off for planting out in November. A variety of cauliflower of the Autumn Giant type should be sown about the middle of the month. This provides one of the most valuable crops of the year, as it comes in just as French beans and peas are finished, and as the heat of summer has passed and autumn rains are falling the heads are sure to be good. In cooler parts savoy-seed should

be sown at the same time. Red cabbages should be sown at once ; this variety is a summer plant, and late plants do very little good.

Early plants of celery will be ready to set out. Market-gardeners have now mostly abandoned the trench system of cultivation. The plants are set out in very rich soil, planting them from 10 in. to 12 in. apart. The plants are fed with liquid manure or by dressings of artificial manure, of which latter nitrate of soda is of great value for this purpose. As self-blanching varieties are grown (such as Henderson's White Plume and Golden Self-blanching), shade provided by close planting, and good growth secured by feeding, a saleable article is cheaply produced. These heads do not provide a salad that lovers of celery would fully appreciate, but they appear to satisfy a good many and are at least good enough for stewing. If really good celery is required the trench system must be employed. Seed should now be sown for the main crop. It is usual at this time to sow in the open ground. In the warmer places it is necessary to shade the seed-beds with canvas screens, or the soil will dry out too rapidly and the seed fail to grow.

Celeriac, or turnip-rooted celery, is raised in the same way as celery. The plants are set out on the flat. Trenches are not required, as the thickened root only is used. This is one of the most delicious vegetables, either in soup or served as a dish. It should be extensively grown where choice vegetables are appreciated. For the control of leaf-spot celery should be early sprayed with bordeaux mixture, 2-2-40 strength, repeating every second week. This has been proved efficient in districts where crops not treated are lost as a result of this disease.

Cabbages and cauliflowers planted out some time ago are now at a critical time. Early cabbages are liable to bolt to flower, and cauliflowers to button while quite small. A little nitrate of soda—1 oz. per square yard, or a heaped teaspoonful spread around each plant—will force growth, and usually carries the plants through this critical period. A like dressing given a month or five weeks later ensures good results.

Jerusalem artichokes should be planted in rows 3 ft. apart and 15 in. between the sets. Plant medium-sized sets of good shape 5 in. deep. Sandy loam is the best soil, but any deep free soil that is not overrich will answer. Superphosphate and wood-ashes are good fertilizers. Farm-gardens should have a good bed of these artichokes. The surplus makes first-class pig-feed—boiled and mixed with mash for young pigs, and uncooked for large animals. In good soil it is a very prolific crop.

POTATOES.

Main-crop potatoes should now be planted. If drills are made, or the sets planted in plough-furrows, artificial manure (which may be potato-manure or superphosphate and bonedust in equal amount) should be placed in the drills, allowing 3¼ lb. for 50 yards of drill. If the sets are planted with a hoe, spread the manure along the line of planting before putting the sets in. Wood-ashes are very beneficial, and they are best placed on the sets. As soon as the plants are well through the ground they should be sprayed with 4-4-40 bordeaux. At this time a dressing of sulphate of ammonia will be beneficial. Broadcast the sulphate along and among the plants, so that it will

reach the roots, and scratch it in. A bare ounce per lineal yard will be sufficient. Confine it to a space reaching about 6 in. on either side of the row.

SEED-ECONOMY.

War conditions have had some effect on the cost of seeds, and have promoted a desire to economize in some ways. My own impression is that the cost of seed is not unreasonable, and that the returns amply repay the cost. I am, of course, speaking of vegetable-gardening, and more particularly home gardens. A leaflet has recently been issued by the English Board of Agriculture to show how economy with seeds may be effected. In some instances, however, the practice recommended will not find general favour in this country, as economy of seed is effected by a smaller weight of crop from a given space, and therefore at an added cost for labour, a much more expensive item than a few seeds, and, more important still, by taking an insufficient supply from the ground available.

A case in point in the leaflet is that of carrots 6 in. apart. Three or four seeds are to be sown at that distance apart and finally thinned to one plant. That would give eight carrots in 4 ft. of row. I would expect to get a month's supply for a small family from that space, but would sow a little more seed. A row 20 ft. long supplied my family, averaging four persons, for eight months. There are two ways of sowing such seeds. One is for use where there is plenty of ground, and for summer sowing. Three or four seeds dropped at intervals of 4 in. and thinned to one will provide roots of good size. If extra-large are looked for, sow 6 in. apart. I consider this too far for garden purposes, resulting in roots that are too large. This plan is not safe for spring work, when allowance must be made for losses from slugs, &c., which would be likely to result in gaps that cannot be afforded in a garden. It is better to draw rather broader drills than usual and scatter the seeds as thinly as possible over the exposed surface, thinning when ready to about 2 in. apart. This will give possibly a quadruple row quite easily managed in a small garden, but, of course, not suitable for field culture. It is customary with market-gardeners to sow turnips in this way, and it gives a large amount of produce in proportion to ground-space.

Onions are sown in narrower drills, but even with these it is not aimed to get the bulbs in single file. To do so it would be necessary either to sow very thinly, and so run risks of having gaps, or to thin out too many.

Beans are the better for regular spacing. Broad beans and runner beans are best planted in double rows, drills being made the full width of the hoe. The beans are placed 10 in. apart in each row, those in the second row being placed opposite the intervals in the first row. This is equal to 5 in. apart in one row, but additional root-space is afforded by the rows being separated. Dwarf beans should be planted closer—double rows with beans 6 in. apart in each row.

Peas are usually broadcasted in the drills. If one had the necessary patience it would pay to plant in the same way as beans, spacing dwarfs 2 in. apart in each row and taller varieties 4 in.

[Notes by Mr. Taylor on the home saving of vegetable-seeds will be published in next month's *Journal*.—EDITOR.]

ANSWERS TO CORRESPONDENTS.

IN order to ensure reply to questions, correspondents must give their name and address, not necessarily for publication, but as a guarantee of good faith. Letters should be addressed to the Editor.

AUXILIARY CROPS FOR DAIRY HERD.

"SHORTHORN," Tamaki :—

Kindly advise me what crops to grow from now on as feed for a dairy herd. The soil is a loam on a heavy clay.

The Fields Division :—

The following is recommended: About the end of August or the first week in September sow 2 bushels oats with 1 bushel early spring tares to the acre. These should be ready for feeding during December. About the middle of October sow turnips—Purple-top Mammoth, Lincoln Red, and Imperial Green Globe. These varieties may be sown at the same time, and should be ready for feeding in January and February. About the beginning of November an area of mixed Cape barley, 2 bushels, and Japanese millet, 10lb. per acre, may be sown for supplementary grazing in January and February. At the end of November maize can be sown. This should be ready for April and May feeding, and if not required can be made into ensilage. When using turnips the roots should be pulled and carted on to a grass-paddock as required, at least twelve hours before feeding, in order to avoid tainting the milk. For each crop use 2 cwt. basic superphosphate to the acre. It is also suggested that you should try to grow lucerne, commencing with a small trial area of, say, 1 acre.

SAVING MANGOLD-SEED.

H. G. A., Maxwelltown :—

Would you kindly give some information as to the best way of saving mangold-seed, from the time the bulb is pulled from the ground; also state when this should be done.

The Fields Division :—

Select the best of the bulbs now and transplant, leaving only the crown exposed above the ground. Place them in rows 2 ft. apart and from 30 in. to 36 in. between the rows. Remove all the leaves, but take care not to injure the crown. Harvest by pulling or cutting just above the ground, and threshing immediately. Care should be taken to grow seed in a sheltered position.

PIG TROUBLES.

C. N. W., Tuatapere :—

I have a line of purebred Berkshire pigs, and have been feeding them on pollard and molasses mixed with water and some boiled and raw swedes, but they seem to get bound up. I have had one die, and in the case of three others their back passage came out. I should be glad to know the cause of these troubles.

The Live-stock Division :—

From the description given it would appear that indigestion is the principal cause of the trouble. Indigestion may be caused by unsuitable food or infection by worms. We would advise that the animals have a large free run upon some suitable piece of ground, and that the molasses be discontinued for a time. Swedes

should do no harm if given raw, but much of the pollard on the market just now is of doubtful feeding-value. In any case try a change, whatever it is, so long as it is a recognized pig-feed. When the back parts come down they should be carefully washed and replaced, but if they have been down for some time the chances are that they will not stay up. In this case the animals should be prepared for early marketing.

GROWING OF DANTHONIA ON FERN COUNTRY.

A. J. P., Pahiatua :—

Can you tell me whether it is practical to sow danthonia on fern country? The soil is rather light and poor; a good proportion is covered with piripiri and fern, which has been eaten down by stock during the summer months. Cocksfoot is the main grass growing amongst the weeds, but there are patches almost devoid of grass. Do you think danthonia would strike on these patches, and what would be the best time of the year for sowing? The climate is damp.

The Fields Division :—

Mixtures including danthonia are regularly sown on poor classes of fern-covered country. The fern should be burnt at the end of February or later, and the seed sown before the beginning of April. Land where the fern is patchy and will not carry a fire, and where a good deal of bare ground occurs, is difficult to deal with, as the bare patches are generally very hard and offer very inferior seed-beds. On such country there is no doubt that heavy stocking in late summer with sheep that have been grazing on good danthonia country is one of the best methods of introducing the grass. If any surface sowing is done it should be carried out in early autumn, and the mixture of danthonia, cocksfoot, crested dogstail, and *Poa pratensis* used. If the ground is of a very poor character, danthonia mixed with Yorkshire fog is perhaps the best to use.

BARBERRY FOR CATTLE-PROOF HEDGE.

DAVID C. LAMB, Hinuera :—

What would you advise planting for cattle-proof live hedges on heavy country in this district?

The Horticulture Division :—

Common barberry (*Berberis vulgaris*) is recommended for a live cattle-proof fence. It does well in most soils and situations, is fairly fast-growing, requires but little trimming, and is not permanently injured by a fire passing through it. Plant in double rows 10 in. apart and 30 in. apart in each row, plants in the second row to be placed opposite the intervals in the first row.

MIXING LIME AND SUPERPHOSPHATE.

C. DAWSON, Cambridge :—

Please advise me whether it is right to mix burnt shell-lime (unslacked) with superphosphate, and, if so, in what proportions. The lime is about 90 per cent. shell.

The Fields Division :—

By treating ordinary phosphate of lime with sulphuric acid a water-soluble phosphate known as "superphosphate" is produced. When superphosphate is mixed with lime it reverts or goes back to the insoluble form, thus defeating the object of manufacture—namely, to get a phosphatic manure which can be distributed in solution intimately through the soil. As, however, superphosphate is an acid manure, the practice of mixing lime to the extent of 15 per cent. with superphosphate to form a more or less neutral but still easily soluble phosphate has become common. The resultant product is known as basic superphosphate. In making it the mixture becomes hot and sets. On the whole it is more convenient to purchase it ready made. Probably the best course to follow is to lime the land, taking care to keep the lime in the surface soil, and to use superphosphate alone, after the liming, for crops.

DEALING WITH SPREAD OF MANUKA.

J. RYLE NEWTON, Otorohanga :—

I shall be obliged if you will inform me as to what you consider the best method of dealing with a surface-sown gully which took grass well but is now more or less thickly covered with tea-tree, being rather too thick to pull by hand. The gully in its native state was heavy fern and tutu, but the previous owner had burnt and sown it at least twice, and allowed it to revert to its original state each time, the fires no doubt causing the tea-tree to spread.

The Fields Division :—

The question that naturally arises is as to whether the manuka can be cut down in its present state, or whether it should get higher before being cut. The feasibility of burning over the area in the autumn is also a matter to which consideration should be given. The previous treatment given the ground will make it very liable to revert to manuka, and we are inclined to think that the most practical method of control (unless hand-pulling from time to time is feasible) is to burn over the area each season. For this purpose the grass should be allowed to get away in the autumn, so that a good fire can be rapidly carried over the area without any great damage being done to the grass. The value of such treatment will depend largely on what are the main grasses. Danthonia, *Poa pratensis*, brown-top, and crested dogstail are not injured at all by quick fires, but, of course, rye-grasses and cocksfoot are. Burning young manuka with the aid of sufficient dried-up grass herbage is often adopted where the main grass is danthonia, and in a few seasons almost pure danthonia is the result. If, however, you are anxious to have as mixed a herbage as possible the burning method is rather against this. You will find that a liberal seeding of *Poa pratensis* is of immense advantage, as it stands burning extremely well. The recent fires in the Raetihi district have shown the value of this grass in this respect. Many areas where *Poa pratensis* was abundant have now quite as good a sward as before the fire, the matted nature of the grass having apparently to a large extent saved the other grasses.

HUMBLE-BEES AND BROAD BEANS.

"INQUIRER," Bull's :—

I find it impossible to grow broad beans on account of the ravages of the humble-bees. Is there a remedy ?

The Horticulture Division :—

No practicable means can be suggested to protect the flowers of broad beans from humble-bees. Spraying with an offensive compound, such as quassia, or even bordeaux mixture, might be useful; but flowers are constantly developing, so that it seems useless to attempt to protect them. However, it is rarely humble-bees do serious damage after warmer weather sets in and the plants begin to flower freely. Top the plants early to conserve their strength.

TREATING COLT FOR WORMS.

J. C. CRUMP, Waitahuna :—

I recently lost a two-year-old draught filly with red worms (small red worms in enormous quantities). I have a colt same age which I consider affected, and in spite of the best of feeding he is getting thinner. I have been giving him turpentine in milk and raw linseed-oil. I also tried kerosene in place of turpentine, but all with no apparent result. Kindly advise as to treatment.

The Live-stock Division :—

Seeing that you have already adopted drastic measures without success, we would advise you to call in a veterinarian to make sure that the colt is suffering from parasites and not something else. However, if this is not convenient you might try again for worms by feeding for a few days upon as much sugar-beet or potatoes and bran as the animal will eat without showing signs of colic. Then

give the following powder once a day for three days in succession: Santonine, 4 grains; exsiccated sulphate of iron, 1 dram; table-salt, 4 drams. This is for one powder, and should be given in a bran mash. Should this be refused, drench with milk added, and afterwards give the bran mash. If you have no difficulty in drenching this is the best plan, and you could then add to the powder 2 drams of powdered aloes.

LAND FOR LINSEED-GROWING.

H. H. MEREDITH, Arno :—

I have on my farm a 10-acre swamp—very heavy rich soil—on which I have grown two successive rape crops. I would like to know if it would be suitable land for a crop of linseed. The land never gets hard, is easy to work, and contains a fair amount of lime. If suitable, what quantity per acre should I sow?

The Fields Division :—

Linseed should do very well on your swamp land. Drill 1 bushel per acre, with 1 cwt. superphosphate, in September—the earlier the better.

MANGOLDS FOR PIGS.

A. CLARKE, Auroa :—

Are mangolds, after being stacked for a month or more and fed in reasonable quantities, detrimental to pigs? Do they affect the breeding propensities of sows in any way?

The Live-stock Division :—

Mangolds should not be fed to pigs until they have been stored at least a month, when they are excellent pig-feed. They do not affect breeding-sows if fed in reasonable quantities.

LUCERNE AFTER ROOT-CROP.

LEN. JONES, Mangere :—

I have a paddock now in grass. I wish to plough it in spring, put in soft turnips and swedes, and then lay down into lucerne. Should I put in a catch-crop after taking swedes out, or will it be too late? The ground is volcanic and very rich, but drys badly in summer.

The Fields Division :—

It is not considered advisable to put in a catch-crop after the swedes. Even after turnips it would be better not to catch-crop unless the need for growing feed on this ground is pressing. Better to plough the ground with a good furrow as soon as possible after the roots are off, and work it as required, and according to weather conditions, for an October sowing of lucerne.

FOWL-MANURE FOR VINERY.

"TWISTER," Roslyn :—

Is hen-manure suitable for manuring a vinery? If so, what quantity can be used without doing harm?

The Horticulture Division :—

If fowl-manure is applied in too large a quantity—say, 4 lb. or 5 lb. to the square yard—injury might be done. Vines have been killed by an excess of nitrogenous manure. Used in moderation it is highly beneficial. It should be mixed with dry earth and kept out of the rain for a time. It can then be applied at the rate of 2 lb. to the square yard.

NOTICE.—A reply cannot be given to "Bush Settler," Tuatapere, regarding Californian thistle and ensilage, unless he supplies his name.

FOOD-PRODUCTION AND THE WAR.

Concluding a review of "The World's Yield of Foodstuffs," under date 1st June last, Sir James Wilson, K.C.S.I., British (and New Zealand) delegate to the International Institute of Agriculture, of Rome, makes the following remarks, which are specially interesting as embodying an after-war forecast :—

Present prospects are that, for the open countries taken as a whole, the yield of foodstuffs in the year 1918 will be much larger than it was last year, or than it was on the average of the five years before the war, and that it will in itself be much more than sufficient to supply the needs of the open countries taken together. There is reason to expect that on 1st August this year the carry-over of foodstuffs in the open countries taken together will be much above the normal; so that there is reason to estimate that, if the war continues for another year, the open countries taken together will have a much larger supply of foodstuffs to dispose of during the year ending with July, 1919, than will be required to meet their probable needs, and that there will be a large accumulation of foodstuffs in the exporting countries, which is likely to lead to a market fall in prices in these countries.

If the war were to end this year there would no doubt be a large demand for foodstuffs from abroad by some of the countries at present closed to trade. Before the war the average net exports of the five cereals (wheat, maize, oats, rye, and barley) were for all the closed countries taken together 63 million quintals*—their imports into Germany, Belgium, and Austria-Hungary averaging 82 million quintals, while the exports from Russia, Roumania, and Bulgaria averaged 145 million quintals. There can be little doubt that the yield of foodstuffs in the latter three countries this year will be much less than the pre-war average, but there may be in some parts of Russia a considerable quantity of old grain still in the hands of the peasants, and it seems quite probable that (including this old grain) the diminished crops of Russia, Roumania, and Bulgaria will be sufficient to provide as much grain for export as will be required, after peace is declared, by Germany, Belgium, and Austria-Hungary. In any case it seems fairly certain that, if peace is declared this year, the exporting countries of the world as a whole will find themselves in possession of a much larger quantity of these five cereals than is likely to be required by all the importing countries during the year ending with July, 1919. And if, as now seems probable, the world's merchant tonnage will by the end of 1919 be equal to what it was on the average of five years before the war, and will thereafter continue for some time to increase rapidly, it seems probable that within a short time after the declaration of peace the rates of ocean freight will fall to something not much above what they were before the war, and, owing to the glut in the world's supplies of foodstuffs, there is likely to be a very great fall in the world's price of foodstuffs, both in the importing and in the exporting countries.

As regards the world's supply of meat, it has to be remembered that, broadly speaking, cultivated land produces much more fodder than grass land, and the increase of cultivation which is taking place in Britain, and in most countries outside Europe, must mean more fodder and more live-stock. Therefore, although no doubt the number of live-stock on the Continent of Europe will be much less than it was before the war, there seems no reason to fear a scarcity of meat in the world as a whole, though there may be some difficulty in arranging for its transport from countries where there is a surplus to countries where there is a deficiency.

To sum up, if the war ends this year or next there is more likely to be in the world, as a whole, a glut of agricultural produce, including live-stock, than a scarcity; and although the gold-prices of all commodities may tend to keep up, owing to the release for currency purposes of large quantities of gold at present hoarded by treasuries, banks, and private individuals, soon after peace is declared food-prices in the world generally, and especially in the United Kingdom, are likely to fall to something not much above their pre-war level.

* 10 quintals are approximately equal to 1 ton.

MILITARY PRODUCTION OF FOOD.

WRITING to Sir James Allen, Minister of Defence, Colonel T. W. Porter states,—

I have received from an old officer at Home an account of the employment of our soldiers in various parts of the world in the cultivation of food-supplies. The information is very interesting, and might be extended to our own camps. "Food-growing is second only to fighting" was the gist of an Army order issued to recruits in France. Much military cultivation of land has been undertaken since then. Every military camp in the United Kingdom, every German prisoners' camp, and every aerodrome has been brought within the area of military agricultural operations. In addition, 50,000 acres have been cultivated behind the lines in France, 7,000 acres at Salonica, approximately 700,000 acres in Mesopotamia, and large areas in Egypt, Palestine, and Cyprus. In France the Army has its own directorate of agricultural production, with Brigadier-General Lord Radnor as Director, working for the cultivation of derelict land in conjunction with the French authorities. The Food Production Department at Home has helped to supply 150 tractors and ploughs and large quantities of seed and seed potatoes. At Salonica the crops comprise 2,100 acres of barley, 500 acres of wheat, 700 acres of potatoes, 2,000 acres of maize, and 1,700 acres of other crops. It is estimated that the work there will result in a saving of 20,000 tons in the quantity of hay required to be imported. In Mesopotamia small irrigating-pumps, driven either by steam or by oil, are used on the banks of the Tigris, and much has been done to restore and turn to good advantage the fertility of what was once the garden of the world. It is anticipated that this year's yield will total 25,000 tons of wheat and 100,000 tons of barley, besides fair crops of other grain. Tractors, threshers, and hand implements of several kinds have been sent from India and Australia as well as from England. In Egypt, Palestine, and Salonica the British armies will this year grow all their own vegetables, and will also produce a large quantity of hay and other forage material for horses. Last year the army in Egypt produced for itself 196,000 tons of hay; this year it is estimated that 424,000 tons will result from its land labours. Last year's yield of barley was 26,000 tons; this year the supply will be about quadrupled. Last year a portion of the armies' sugar-supply was imported; this year the whole requirements, both for Egypt and Salonica, will be produced in Egypt. The figures from the Aldershot command prove what great work has been accomplished in England. Only 28 acres were being cultivated there eighteen months ago, in April (of this year) 12,000 acres will be under cultivation. Large quantities of potatoes, vegetables of all kinds, and oats are being grown. Soldiers do all the work in their spare time; the men mostly belong to non-combatant battalions, and Germans are also employed. The land workers of the Army have plenty of expert guidance. Many soldiers with agricultural experience render most valuable help. The work of food-production has been most enthusiastically taken up by all soldiers, and they vie with one another in producing the finest vegetables.

The New Zealand Expeditionary Force units in the United Kingdom were specially complimented last year for the amount of work done by them in connection with agriculture. Anticipating the food-shortage, as much land as possible was ploughed and cultivated, with the result that vegetables to the value of about £3,000 were grown and used for local messes. This year about 350 acres have been ploughed, and it is hoped that last year's production will be trebled.

It is notified by the Customs Department that no permits for the exportation of tallow to the United States can be granted unless the exporter is prepared to give security to the Collector of Customs, at the rate of £20 per ton, for delivery to the Imperial Munitions Board, Ottawa, or to the Ministry of Munitions, London, of the glycerine-content of the tallow, calculated as equal to at least 10 per cent. by weight of crude glycerine containing at least 80 per cent. of anhydrous glycerol. The price at present fixed for crude 80-per-cent. glycerine is £150 per ton, and for 88-per-cent. saponification glycerine, £165 per ton.

CONTROL OF BROWN-ROT IN AMERICA.

THE following communications have come to hand from Mr. T. W. Carter, of Berger and Carter Company, San Francisco, through Messrs. Blair, Reed, and Co., of Wellington. Mr. Carter, who was recently in New Zealand, promised on his return to California to get into touch with some of the leading growers relative to the more recent methods adopted by them in the control of brown-rot, and transmit the results. He states,—

We have corresponded considerably with our connections in Oregon, and the following gives the practice followed by one of the growers. He heavily manures the orchard in the fall, using sheep-manure from the stockyards by the cartload. Just as soon as he can get on the ground in the spring he commences to plough, so that the spores coming up from the decayed prunes of last season are broken up and also turned under. His spraying consists entirely of bordeaux mixture, giving two and sometimes three applications. He claims best results when he can apply just before blossoms open. He gathers the old prunes in the fall, as well as old leaves and dead limbs, and all are burned. This gentleman, while operating at a very heavy expense, has made more money than any prune-grower in Oregon. Climatic conditions have a great deal to do with it, and unless the trees are vigorous and the orchard kept very clean the spraying will hardly repay its cost in a year favourable to fungus. If the brown-rot is in apples, bordeaux mixture or lime and sulphur (about 1 in 30) will control it if the spraying is done early. The same care in trees and orchard will help this as well, and will be much more marked than with prunes.

A Californian firm writes,—

The subject of brown-rot has been before experts, both national and State, and the remedy has not yet been found to overcome it. But the lime-and-sulphur spray and the bordeaux mixture are the only things so far that have been used. Bordeaux mixture has been used mostly in our State on brown-rot on apricots, as that is the only thing that has been affected by it here, and it keeps it under control to quite an extent, but not entirely. It has to be used in the dormant season. You could not use either bordeaux mixture or lime and sulphur to do any good after the foliage is out, or the blossoms.

ELECTRO-CULTURE: A NEGATIVE RESULT.

IN the *Scottish Journal of Agriculture* for April, 1918, Professor Hendrick, of Aberdeen University, describes a series of experiments on a Kincardineshire farm in the treatment of crops with overhead electric discharges, and gives the following conclusions: "In the experiments at Mains of Luther the application of a high-tension electric discharge on the Lodge-Newman system to growing crops has been very thoroughly tested over a period of five years, and no consistent improvement in any of the crops grown—oats, barley, hay, potatoes, turnips, and swedes — has been obtained through the application of the electric discharge. There seems, therefore, no reason to suppose that electric current applied in this way to growing crops will give results which will repay the cost and trouble incurred. Much more scientific work appears to be required in order to determine the effects of electric discharges on growing plants before we are in a position to apply electric treatment economically to farm and garden crops, or even to decide what kind of apparatus should be used for such a purpose."

The Order in Council of 23rd March last, fixing the maximum price of grass and clover seeds (following the bush-fires in the Waimarino district), was revoked on 23rd July.